SINCLAIR

QL WORLD

Every Month £1.25 October 1987
DENMARK DKR 40.00
GERMANY DM 9.00
NETHERLANDS DFL 9.25

BATTERY BACKUP SYSTEMS

Artificial game play

DIY window blocks

CAMBRIDGE SYSTEMS TECHNOLOGY

24 Green Street, Stevenage, Herts SG1 3DS
Telephone: Stevenage (0438) 352150

Thor

The Thor Computer System is a professional business machine designed with the user and his future requirements in mind. Cambridge Systems Technology have developed several models making the Thor extremely versatile: the single NEC 3.5in. floppy version with or without a 20M SCSI Winchester in addition to the dual floppy model packaged in a stylish metal case. The Thor is equipped with 640K RAM, parallel and serial printer ports, battery-backed clock and a separate IBM style (PC-AT) keyboard. Supplied free with the Thor is a specially commissioned version of the award winning Psion Xchange(*) software suite and a comprehensive manual. Special features of the Thor include multitasking at a single key-stroke and enhanced screen windowing representing excellent value for money.

Thor 20

The Thor 20 Computer System is the newest development from Cambridge Systems Technology, the very latest in high-speed processing. Based on the Motorola MC68020 processor, the Thor 20 delivers on average three times the computing power of the Thor. It is available with a choice of two clock speeds: 12.5 MHz (standard) or 16.7 MHz. The Thor 20 package includes a suite of development software comprising a specially commissioned macro assembler by Talent Computer Systems and a linker by GST in addition to the Psion Xchange(*) business software together with full supporting documentation. The Thor 20 Computer System provides a substantially higher performance than the Thor at a very cost-effective price.

Thor 21

The Thor 21 Computer System is designed for 'number crunching' applications. Based on the 68020 processor and additionally incorporating the MC68881 floating point coprocessor, the performance of floating point operations are dramatically improved — taking only 1% of the time taken without the coprocessor. This system is essential for a wide range of scientific and engineering applications and only costs an additional £201.25 (inc VAT).

NEW MONITORS

CST now offer a choice of monochrome or colour monitor suitable for use with the Thor range of computers. The Microvitec 1451/DQT 14" colour monitor includes interface lead and a tilt and swivel base. The Phillips 7502 12" monitor has a dark anti-glare screen, horizontal/vertical size adjustment, position adjustment, brightness and contrast adjustment and a foldable foot. Both of these monitors have been selected by CST from the wide array of available monitors for their superior performance and reliability when used with the Thor computer range.

QDisc Interface

The best-selling floppy disk interface is fitted with a 16K EPROM containing many 'Toolkit' extensions, and CST's Ram Drive 2. It may be used with most 3.5 or 5.25 floppy disc drives. CST's own twin slimline double sided 80 track 3.5 units being exceptional value for money, with 720K of formatted storage per drive. The Toolkit provides a wide range of SuperBASIC commands and functions designed to improve access to the powerful facilities of the QL without the need for machine-code programming. Job control is made easier, files can be used for random access, alternative character sets can be produced, 'wild cards' can be used in file operations, etc.

The Ram Drive device driver allows free memory to be used as though it were a very high speed disc, in fact the fastest such device when used with the RAM-plus. Ideally used for the storage of temprary results, or multiple screen images for animated displays, it also eases the copying of files in single disc systems. The Ram Drive can only use memory which is free, so the full advantage is only felt if the QL is equipped with additional memory. Built into QDisc 4 and Thor, the Ram Drive is also available on 3.5in. and 5.25in. floppy disc.

RAM Plus

The CST RAM-plus unit expands the available memory of the QL to the limit of 640K. Using high grade 256K memory devices, this unit is the only one which offers the high performance of no wait-state operation. Housed in a rugged metal case, the RAM-plus unit has an expansion slot which duplicates the QL's, allowing any other CST peripheral to be used. Among the advantages derived from using the RAM-plus are the performance improvements of software and storage devices, and the ability to multitask several programs at once.

* Xchange is a Trade Mark of Psion Ltd.

Please supply:-	UK inc VAT		Overseas	
Qdisc Interface 4 (3.5in. util disc)	£79.95	☐	£72.70	☐
Qdisc Interface 4 (5.25in. util. disc)	£79.95	☐	£72.80	☐
QEP-III Eprom programmer (QL/THOR)	£129.95	☐	£116.00	☐
RAM-plus 512K QL memory	£139.95	☐	£125.20	☐
CST Dual 3.5in. cased floppy discs	£219.95	☐	£200.40	☐
CST Q-488 GPIB instrument interface	£224.25	☐	£198.40	☐
CST QDISC SCSI interface	£230.00	☐	£203.40	☐
Qdisc 4 + dual 3.5in drives	£275.00	☐	£249.40	☐
Qdisc 4, RAM-plus + dual 3.5in. discs	£405.00	☐	£363.60	☐
3.5in Utility disc inc. Ram Drive 2	£10.00	☐	£10.00	☐
5.25in. Utility disc inc. Ram Drive 2	£10.00	☐	£10.00	☐
Eprom V1.16 for issue 2/3 Qdisc	£15.00	☐	£15.00	☐
Eprom V1.19 for issue 4 QDisc	£15.00	☐	£15.00	☐
Thor 1F (Single floppy)	£688.85	☐	£650.00	☐
Thor FF (Dual floppy)	£803.85	☐	£750.00	☐
Thor WF (Winchester + floppy)	£1608.85	☐	£1450.00	☐
Thor 20 1F (Single floppy)	£1292.60	☐	£1179.00	☐
Thor 20 FF (Dual floppy)	£1407.60	☐	£1279.00	☐
Thor 20 WF (Winchester + floppy)	£2212.60	☐	£1979.00	☐
Thor 21 1F (Single floppy)	£1493		£1354.00	
Thor 21 FF (Dual Floppy)	£1608.85		£1454.00	
Thor 21 WF (Winchester + Floppy)	£2413.85		£2154.00	

Available as an upgrade for existing Thor owners.
For floating point option contact CST.

For the Thor Range:		
Phillips Monitor (Monochrome)	£92.95	£80.83
Microvitec Monitor (Colour) + Tilt Stand	£295.00	£256.52
Additional 12m Service contract (1F & FF)	£86.25	£75.00
Additional 12m Service Contract (WF)	£115.00	£100.00
Beige Mouse	£63.94	£57.60
Psion Chess	£24.95	£22.70

Export administration	£5.00	☐
Airmail outside Europe	£5.00	☐

Prices are inclusive of carriage
CST reserve the right to alter prices and specifications without prior notice

Please complete in full

Name .....

Address .....

.....

.....

Post Code..... Telephone .....

I enclose a cheque/PO of £ .....

Please deduct my Access/Mastercard/Eurocard/Diners Club/Vector a/c

Card No. | | | | | | | | | | | | | | | | |

Expiry Date .....

Signature .....

Access BARCLAYCARD VISA MasterCard DINERS CLUB INTERNATIONAL

SQLW10

SINCLAIR QL WORLD

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Unfortunately, we are no longer able to answer enquiries made by telephone. If you have any comments or difficulties, please write to The Editor, Open Channel, Trouble Shooter, Technical Helpline or Psion Solutions. We will do our best to deal with your problem in the magazine, though we cannot guarantee individual replies.

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OCTOBER 1987

NEXT MONTH

Of Mice and Machines

We look in depth at the mice, the interfaces and the software available for the QL. How accurate are they? How compatible are they? Internal or external upgrade? We give you the facts, the figures and much more.

Stars & Stripes

The QL in the U.S. How does it sell? Some of the US advertisements would see to rank the QL in the same league as, say, a top-of-the-range Cray. We look at the American market and the future of the machine in the States. We will also have reviews of some stateside software.

Introducing QTALK

PRICE	
Qtalk	£75.00
VAT	£11.25
Post/Packaging	£ 2.25
Total	£88.50

Qtalk Applications

1) **Health**
   - a viable solution to speech impairment/impediment
   - allows the blind to write documents and programs
2) **Education**
   - an excellent tool for teaching the relationship between the written and the spoken word
   - a valuable aid to those assisting the dyslexic or for students with reading problems
   - an amazing new method for teaching or learning the translation of one language to another
   - touch typing made easy with keyboard echo
3) **Industry**
   - enables verbal output of readings/warnings from independent peripherals. (BUS, IEEE, RS232 etc)
   - can be used to give instructions to an operator
   - could be set up as an answerphone or entryphone
4) **Entertainment**
   - allows the user to verbally list programs while checking them against a hardcopy listing
   - can be made to hum musical tunes
   - provides a whole new dimension to computer games

Hardware Features

RS232C, Selectable baud rate, DCE or DTE
- will operate on any computer with an RS232 port
- at any standard baud rate
- does not tie up the expansion port

Three adjustable presets:
- allows adjustment of Volume, Pitch and Pitch range (16 levels)

Black Eurocard enclosure, QL plug, power lead, socket and serial cable
- simply plugs in between your power supply and QL
- maintains the integrity of your computer system

(Note. CST Thor version is powered through the serial lead)

Software Features

Full 68000 Text To Speech software incorporating 16 levels of pitch.
- lightning fast conversion of any string into speech
- any multi syllable word may be split, with different syllables spoken at differing levels of pitch, allowing intonation
- 20K of code. Will work on standard (128K) machine and Thor

Built in Exception Table (BET)
- certain words defy all logic and no amount of rules can cater for these. Therefore, their pronounciation has been permanently set in an exception table. eg 'thorough', 'ghoti', 'Lbytes', 'flp1'

Size selectable User Exception Table (UET)
- Users can set up their own table of any size and fill it with their own words/pronounciations. This overrides words in the built in table therefore allowing translation of languages. This table can be saved and reloaded for later use.

Over 400 rules to convert text to speech.
- If the word or string is not found in either table it will be pronounced via a sophisticated set of rules.

Full Device driver implementation.
- a new device called 'QTK' is added to the QL's list of devices. This means that you can use all of the built in basic keywords to send information to QTALK. eg PRINT, LIST, DIR, COPY etc. and also use QTALK with other computer languages (PASCAL, FORTRAN etc)
- a set of clever superbasic extensions is also included to make QTALK a breeze to use
- may be set to pronounce or ignore punctuation

Multitasking screen editor
- can be called up any time to set up and add, alter or delete words from the User exception table. Comprehensive on screen help.
- Hopefully the last word in QL clocks — talking time and date

Many more thoroughly documented features

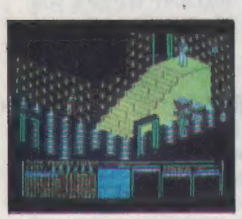
ALIEN HIJACK

The year is 2003 and you are working on the S.P.C. Forward, as ship's engineer. On the 23rd day you are attacked by an alien space ship and all hell breaks loose. You must regain control of your ship, against some mighty tough opposition.

The first TALKING game for the Sinclair QL. Possibly the most amazing QL graphics seen to date

- 3D graphics
- Full 68000 code
- 192 colour screens
- fast, dynamic, challenging
- talking hero and aliens

Note. Alien Hijack does not require QTALK to run but it certainly makes it a lot more fun. Works on a 128K QL.



PRICE	
Alien Hijack	£15.00
VAT	£ 2.25
Post/Packaging	£ 1.00
Total	£18.25

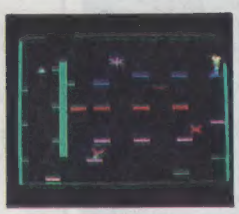
PUZZLE MANIA

Your mission, should you decide to accept, is to journey about the danger ridden cells of Maniaville to retrieve the lost loot of Lawless Lenny. Several obstacles will attempt to thwart your progress and only the smartest gamer will survive.

The second TALKING game for the Sinclair QL

- full 68000 code — 40 colour screens — fast, arcade action
- spoken clues to help you win (if you are good enough)
- almost impossible to beat — a really addictive challenge

Note. Puzzle Mania can operate without QTALK but is much more fun with it.



PRICE	
Puzzle Mania	£10.00
VAT	£ 1.50
Post/Packaging	£ 1.00
Total	£12.50

Special Introductory Offer

Buy QTALK, PUZZLE MANIA and ALIEN HIJACK and receive £5.00 discount pre VAT total (offer closes 31st Nov 1987)

Name _____

Address _____

Please rush me _____

for my **QL/THOR** (cross out one which does not apply)
with software on 3½" **disc/mdv** (cross out one which does not apply)

I enclose a **bank cheque** for £ _____
or please debit my **Access/Visa card** (cross out one which does not apply)

Card number |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

Expiry date _____ **Signature** _____

I appreciate that no funds will be deposited until despatch of goods.
Please allow up to 21 days for delivery (airmail).

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(New Zealand)

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or
Maxtronics R & D Ltd: 26A Conway Street, Christchurch 2, New Zealand. Telephone (64-3) 325-546

TURBO V2.0

THE NEW TURBO V2.0 SUPERBASIC COMPILER IS A VERY SOPHISTICATED (THOUGH SIMPLE TO USE) SYSTEM THAT CONVERTS YOUR BASIC PROGRAMS INTO M68000 MACHINE CODE. IT REQUIRES NO KNOWLEDGE OF PROGRAMMING OR MACHINE LANGUAGE ON THE PART OF THE USER.
V2.0 IS MUCH MUCH MORE USER-FRIENDLY THAN ANY OF ITS V1.x PREDECESSORS. IT HAS AN INCREDIBLE 196 (ONE HUNDRED AND NINETY SIX !!) DISTINCT COMPILE OPTIONS TO ALLOW YOU EASY, AUTOMATIC FINE-TUNING OF THE PROGRAM: PREVIOUS VERSIONS OF TURBO HAVE LESS THAN 20. THERE IS ALSO MUCH GREATER (100%?) COMPATIBILITY WITH THE THOR AND EVEN WITH SEVERE AND HOSTILE OPERATING ENVIRONMENTS. THE DETAILED MANUAL HAS BEEN REVISED AND IMPROVED. THE TOOLKIT HAS BEEN EVEN FURTHER EXTENDED.
THE APRIL/SEPTEMBER ISSUES OF QL WORLD CONCLUDED THAT V1.12/1.13 WERE THE BEST, FASTEST COMPILERS - THREE VERSIONS ON, V2.0 IS LIGHT YEARS AHEAD!

OVERVIEW

TURBO IS PROBABLY THE FASTEST AND MOST FLEXIBLE BASIC COMPILER AVAILABLE ON ANY MICRO, AND IS THE SUPREME QL COMPILER.
THE PACKAGE INCLUDES THE SPECTACULAR 180 ROUTINE TURBO TOOLKIT.
THE TURBO SYSTEM COSTS £39.95
(TOOLKIT ALSO SOLD SEPARATELY FOR £29.95)

SUPERCHARGE owners may upgrade to TURBO system during October for just £65. Send the SUPERCHARGE manual + a/c and your lenslok. IF you don't need the speed and features of TURBO, SUPERCHARGE V1.19 at £49.95 is a classic bargain!

EYE-Q

EYE-Q IS, TO PUT IT BLUNTLY, THE VERY ULTIMATE QL GRAPHICS PACKAGE. NO ARGUMENT. EVERY REVIEW THAT HAS BEEN WRITTEN ON EYE-Q REACHES ONE AND THE SAME CONCLUSION - EYE-Q IS THE BEST. THEY HAVE GOT US BELIEVING IT TOO.
WE LOOKED AT EVERY SINGLE COMMAND ON EVERY ONE OF THE NUMEROUS QL GRAPHICS/CAD SYSTEMS: THEN WE PUT THE LOT TOGETHER ACCOMPANIED BY ALL THE EXTRA FEATURES WE COULD DREAM UP. THE RESULT - EYE-Q V2.1.
A COMPLETE FEATURE LIST IS OUT OF THE QUESTION - IT WOULD FILL THE ENTIRE AD. WE WILL MENTION 3 RUBBER BANDS, UPTO 16 TIMES ZOOM, INTELLIGENT FILL, PAN/SCROLL, 256 COLOURS, HI+LO RES, FONT EDITOR, POP-UP MENUS, HIERARCHICAL UNDO, FREEHAND DRAWING- AND LOADS AND LOADS OF OTHER EXCITING FUNCTIONS, UTILITIES AND COMMANDS. MAGNIFICENT!
<EYE-Q LOVES ULTRAPRINT>

OVERVIEW

WHAT MAKES EYE-Q THE MOST FANTASTIC QL ART+CAD PROGRAM IS NOT JUST ITS UNPARALLELED RANGE OF FEATURES, BUT ITS EXCEPTIONAL SMOOTHNESS
EYE-Q IS AN ABSOLUTE JOY TO USE!
£29.95 BUYS YOU EYE-Q
£69.95 BUYS YOU EYE-Q PLUS A GENERAL PURPOSE ST TYPE MOUSE SYSTEM!!

DESKTOP PUBLISHER V2.0

FOR THOSE WITH AT LEAST 512K RAM AND A DISK DRIVE, WE HAVE PRODUCED THE UNBELIEVABLE DTP SPECIAL EDITION. THE 2.0. (FOR THOSE WITH SMALLER EXPANSIONS OR MICRO DRIVES V1.0, WHICH IS EXCELLENT, IS AVAILABLE FOR £59.95)
V2.0 HAS ALL THE FEATURES OF V1.0 PLUS:

- WINDOWS LARGER THAN THE VISIBLE SCREEN. CAN BE UP TO SIZE OF PAGE!
- ABILITY TO LOAD PAGES DESIGNED BY FRONT PAGE!
- AUTO SIZE INCOMING TEXT FOR BEST FIT. THIS HAS FULL MANUAL OVERRIDE
- AUTO-HYPHENATION ON INCOMING TEXT
- LINE, ARC, CIRCLE, ELLIPSE DRAW ROUTINES
- FULL FEATURE TEXTURE FILL ROUTINE
- OVER 7000 TEXTURES
- 21 INTEGRAL QL CHARACTER SETS
- CHANGE CHARACTER INSIDE TEXT
- USE ANY OR ALL THE 21 SETS IN ONE PIECE OF TEXT
- USER SELECTABLE WORD WRAP ON TEXT
- UNDERLINE INDIVIDUAL WORDS
- INVERSE INDIVIDUAL WORDS
- RIGHT JUSTIFICATION TO WORD OR CHARACTER
- FOR JUSTIFICATION SPECIFY THE PERCENTAGE LINE FILL OR SPECIFY THE LARGEST GAPS
- SPREAD INDIVIDUAL WORDS ACROSS WINDOW
- FULL QUILL_LIB AND _DOC COMPATIBILITY, EVEN PAYS ATTENTION TO CONTROL CODES: BOLD IS BOLD, ITALICS IS ITALICS, ETC
- LOAD TEXT ACROSS ANY AREA UP TO THE ENTIRE PAGE IN ONE GO
- LOAD 16X16 FONTS ACROSS ANY AREA UP TO THE ENTIRE PAGE IN ONE GO
- JUSTIFY 16X16 FONTS
- TURN PAGE UPSIDE DOWN
- MIRROR IMAGE PAGE
- INVERT PAGE
- DIFFERENT PAGE SIZES FOR A5, A4, A3 PAGES.
- INVERSE, REFLECT OR INVERT TEXTURE
- DEFINE YOUR OWN TEXTURES
- SAVE SCREENS OUT OF DTP
- MILD CARD DIRECTORY WITH AUTO PAUSE
- ALL SELECTIONS NOW THROUGH EITHER KEYPRESS OR MENU BAR
- 16X16 FONTS NOW MUCH FASTER
- SPECIFY SINGLE, DOUBLE OR QUADRUPLE DENSITY PRINTER DUMPS
- ALL MAJOR GRAPHIC COMMANDS NOW SELECTABLE THRO' MENUS
- UNDO FEATURE IN MOST MODES
- LARGER PAGE SIZES FOR EXEC TYPE PRINTERS
- REDEFINE FOREIGN CHARACTER SETS

OVERVIEW

DESKTOP PUBLISHER DESIGNS PAGES. THE SKY IS THE LIMIT!

SPECIAL EDITION DESKTOP COSTS £79.95: FOR THE VERY ULTIMATE WE RECOMMEND -

SPECIAL DTP + EYE-Q	£104.95
SPECIAL EDITOR + DTP	£119.95
ALL THREE SPECIALS	£139.95

IF YOU HAVE AN EARLIER VERSION OF DTP (THE FRONT PAGE OF THE MANUAL WILL NOT HAVE THE WORDS 'SPECIAL EDITION' ON IT) WE STRONGLY RECOMMEND YOU TO UPGRADE! SEND US THE DISK (ANYWAY) AND £25. THIS IS AS WAS PREPARED ON AN EARLY VERSION OF DTP BY OLIVER, AGED TWELVE

HERE IS SOFTWARE THAT MAKES TURBO EDITOR AND EYE-Q LOOK LIKE S**T..!

THE NEW V2.0 PROGRAMS!

SUPER SPRITE GENERATOR V4.0

A superb games designer, but many serious animation uses too. Can be used with EYE-Q.

SUPER ARCADIA £9.95

THE MOST SENSATIONAL ARCADE GAMES

GAMES!

SUPER BACKGAMMON

FOR £12.95 WHAT MORE COULD YOU ASK?

BLOCKLANDS £9.95

AN ADDICTIVE MIND GAME..GREAT!

DROIDZONE £9.95

SIMPLY MIND NUMBING

SUPER REVERSI £9.95

THE ULTIMATE IN BOARD GAMES

EDITOR V1.17 V2.0 SPECIAL

QUILL IS A BEGINNER'S TOY; EDITOR IS THE REAL THING! SUPERB FILE HANDLING CAPABILITIES-IT CAN HANDLE DOCUMENTS, PROGRAM LISTINGS, QL SCREENS-EVEN EDITOR ITSELF! ONSCREEN HELP, MASSIVE CONFIGURATOR WHICH ALLOWS YOU TO SET DEFAULTS FOR EVERYTHING, FULL MULTI-TASKING COMMAND FILES, COMMAND FILES WITH PARAMETERS, OVER 100 COMMANDS- AND IS AN INCREDIBLE 30-200 TIMES FASTER THAN QUILL <COMPARE WITH TURBO QUILL WHICH IS AT BEST 1.2-1.4 TIMES FASTER THAN QUILL> EVERYTHING HAPPENS INSTANTLY.
A FULL PRINTER DRIVER IS INCLUDED, DOING EVERYTHING THAT QUILL'S DRIVER DOES AND LOTS MORE BESIDES <MULTICOLOUR OUTPUT, MULTI-LINE HEADERS AND FOOTERS, VARIABLE CHARACTER AND LINE SPACING, UDG'S, CONDENSED, ITALICS, DOUBLE WIDTH, INTERNATIONAL CHARACTER SETS, PAUSE FOR DAISY WHEEL CHANGE, SPOOLING, VARIABLE OFFSET/START NO, PAGE SEQUENCING, ALL STYLE FONT OPTIONS AVAILABLE ALL THE TIME, EVEN IN HEADERS AND FOOTERS>....

THERE ARE TWO VERSIONS OF EDITOR - ONE THAT WORKS ON ANY QL, AND A SPECIAL EDITION EDITOR, WITH OVER 20 ADDITIONAL FEATURES BUT WHICH NEEDS SOME RAM EXPANSION.
THE SPECIAL EDITOR HAS JUST BEEN UPGRADED TO AN AMAZING V2.0, WHOSE ADDITIONAL FEATURES OVER V1.18 INCLUDE:
♦COLUMN BLOCKS♦FLOATING MARGINS♦ADJUSTABLE CURSOR SPEED♦IMPROVED MEMORY MANAGEMENT♦EXECUTABLE LINES WITHIN FILES♦RUN-TIME MODIFICATION OF COLOURS AND SIZES♦RIGHT JUSTIFICATION MAINTAINED EVEN WITH MNEMONICS AND PRINTER CONTROL CODES ♦NEW ENLARGED DOCUMENTATION♦SWITCHABLE INSTANTLY UPDATED WORD COUNT.

OVERVIEW

MORE THAN A MERE WORD PROCESSOR: SIMPLY BRILLIANT, YOU CAN'T DO WITHOUT IT!!

THE UPGRADE FROM ORDINARY TO SPECIAL EDITOR COSTS £5 AND INCLUDES A MANUAL EXCHANGE

SPECIAL EDITOR..£49.95
EDITOR.....£29.95

PROFESSIONAL ASTROLOGER V1.5

Now TURBOCHARGED for the ultimate in speed, this program gives you an unbelievably detailed day-to-day and year-to-year forecasts, a revealing personality profile and an intimate compatibility testing mode between two persons. All the features that pro astrologers ask for are present - but the program is absurdly easy to use, even for those who could not tell a zodiac wheel from a daisywheel. 3D solar system display, 5 co-ord systems, 4 planet phase display, eclipses, planetarium views - for any date, time and location.
A SIMPLER, CUT-DOWN VERSION CALLED SUPER ASTROLOGER IS AVAILABLE FOR JUST £24.95

PROFESSIONAL ASTROLOGER £59.95
PROFESSIONAL ASTROPOWER £29.95
BOTH TOGETHER COSTS £69.95

SUPER FORTH

THE MULTITASKING V2.0 STAND-ALONE SUPERFAST FORTH-83 SYSTEM COMES WITH A VERY POWERFUL COMPILED OTHELLO - IT BEAT ADI, 1985 WORLD CHAMPION. THE MANUAL HAS BEEN EXTENDED, AND STRING HANDLING IS AT LAST FULLY SUPPORTED. SUPERFORTH IS TOTALLY COMPATIBLE WITH QDOS. FOR HIGH SPEED M68000 CODE, SUPERFORTH IS #1

SUPERFORTH £39.95 COMPLETE

BETTER BASIC £24.95

THIS PROGRAM TRANSLATES PROGRAMS WRITTEN IN VERY BAD SUPERBASIC, OR IN ZX OR BBC BASIC, INTO FRESH CORRECTED ANNOTATED TIDY SUPERBASIC

ULTRA PRINT

THIS SUPERB, MULTITASKING PRINTER DUMP PROGRAM ALLOWS GRAPHIC SCREENS <PRODUCED BY EYE-Q OR WHATEVER> TO BE HARDCOPIED IN 24(!) DIFFERENT STYLES WITH UPTO 5 PASSES. A MUST FOR EPSON/OKI COMPATIBLE OWNERS. EXCELLENT FOR PICTURES, CAD AND PCB DESIGN.

COSTS £39.95, OR £14.95 IF BOUGHT WITH EYE-Q!!!

SUPER MEDIA MANAGER

REPAIRS CORRUPTED/DAMAGED DISKS+CARTRIDGES. PERMITS IMPORT/EXPORT OF FILES TO AND FROM NON-QL MEDIA. DIRECTORY SORT. DIRECTORY OF DIRECTORIES. MAP/SECTOR CLONING AND MANY EXCITING FEATURES. SMM CANNOT LONG CONTINUE TO BE SOLD BY US AT ONLY £39.95

CARTRIDGE ONLY VERSION £24.95

- UK delivery costs are all-inclusive. Europe add 5%, elsewhere 10% to cover airmail costs.
- Program upgrades can be obtained by sending us the original cartridge (NOT the packaging or documentation) plus £10 (£12 Europe, £15 elsewhere).
- BONUS – £1 off if you buy 2 programs, £2 off on 3, £3 off on 4, etc.
- A deluxe stand-alone keyboard is available for £89.95 (it has numeric and cursor keypads) – or just £174.95 if bought together with TURBO. Or get TURBO + ICE £119.95 – or £129.95 including ChoICE.
- The GigaMOUSE system and the GigaSOUND system cost £89.95 each – 10% discount if bought with any DP program.

DIGITAL PRECISION

To: DP, 222 THE AVENUE, LONDON E4 9SE (Or use the Credit Card Hotline 01-527 5493)
Please rush me .....
.....
Name ..... Address .....
..... Postcode .....
Enclosed ☐ Cheque ☐ Cash ☐ P.O. ☐ Access/Mastercard ☐ Visa/Barclaycard
for the amount of £..... Number ..... Expiry date .....
Please indicate if you have ☐ 3½" disks ☐ 5¼" disks ☐ Microdrives only SQLW 10
If you have disks, do you get ☐ 720 sectors ☐ 1440 Sectors Signature .....

DIGITAL PRECISION

COMPUTERS

QL JS 2.3 software	£169
QL640 JS 2.3 software	£260
Thor & Z88	phone
Psion Organiser II XP	£138

EXPANSION BOARDS

512K Miracle Expanderam	£99
512K Internal upgrade	£94
512K SQB & Mouse	£287
768K Trump Card	£199
Eprom expansion board	£68

MONITORS

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QL SCENE

Multi dual disc drive

Sandy UK is soon to launch a new disc drive for the QL and other microcomputers. Unlike normal dual disk drives, it features both 3.5in. and 5.25in. drives, one of each, with the 5.25in. being 40/80-track switchable.

That kind of format will not necessarily appeal to all QL owners. It means that to use dual drives they will have to use both sizes of disc, rather than a single size. To many users, however, it will be a boon. Even the normal user could keep application programs on one size and data on another. For boot purposes drive one will be switchable between the two sizes.

Sandy knows of no other manufacturer with such a product and sees it being particularly useful for users of its CP/M Emulator package. CP/M programs tend to be in a variety of disc sizes and formats and with the new drive users can be certain of being able to read them.

The dual disc drives cost £209 including VAT, postage and packing. For further details contact Sandy (UK) PCP Ltd, Unit 33, Murdock Road, Manton Lane, Bedford MK41 7PQ.

Odd poke

In the August, 1987 issue Psion Solutions page, a feature entitled Clever Dixons Chap included a program to produce a graphic dump with a serial 8056 printer. Unfortunately there was a minor mistake which many readers have noted and thanks are due to those who sent letters pointing out the error in line 120. It was printed in the magazine as:

120 POKE_W addr+181,50

Naturally you will have problems if you try to poke a word value to an odd address. Most readers guessed that the line should have read:

120 POKE addr+181,50

and are now dumping screens satisfactorily on to their non-graphic printers.

Fantasy Quest

PCBS, producers of *The Heart of Gern* adventure program, is soon to release a new game called *Talisman*.

This fantasy quest will be based along the *Dungeons and Dragons* style of role-playing games.

At the start you will be given the option of four character classes — Warrior, Warrior/Priest, Rogue or Magic User. Based on that choice you will be given some starting equipment and some funds to begin you quest.

You are then ready to enter the randomly-created dungeon. There are an infinite number of possible levels, each with a maximum of nine rooms, and the probability of meeting nastier monsters, better treasure and finally The Talisman increases as you descend. Your torchlight will show only the area around your character, so you will have to map the dungeon levels as you explore them.

On your journey you might meet traders who could be persuaded to exchange items. Do not forget food, because the game keeps track of time and your performance could be impaired if you do not eat. Time is also important if that vital potion is losing its potency.

The game is designed for expanded machines, containing data for more than 100 monsters and 100 magic items. As you progress, the computer keeps track of your experience level and hit points. The game is supplied with an extensive 30-page manual.

Roulette remedied

The September 1987 Program of the Month, *Roulette*, contained a small bug which may be confusing some readers. Fortunately it was spotted early, so it should not cause too much difficulty. The error is in line 4840. In the magazine listing it was printed

4840 FOR w=1 TO 4

It should read:

4840 FOR w=1 TO 36/fctr

Once that is done, the program will work correctly.

OPEN

Open Channel is where you have the opportunity to voice your opinions in *Sinclair QL World*. Whether you want to ask for help with a technical problem, provide somebody with the answer, or just sound off about something which bothers you, write to: Open Channel, Sinclair QL World, Greencoat House, Francis Street, London SW1P 1DG.

AI on QL

May I join your correspondent pleading for a reasonably-priced Prolong interpreter for the QL Open Channel, August, 1987. In the meantime I will continue with AI work using SuperBasic. I am particularly interested in the understanding of natural language. Any articles on the subject will be of interest to me and many addicts.

The book I use is "*The Intelligent Micro*' by Noel Williams published by McGraw-Hill. While the book is helpful in many ways it would have been easier to use if the programs were copied directly from printouts. In addition, dare I suggest that not all the programs in the book would run without correcting typing mistakes and altering some lines in the programs?

Eddie Ross,
Oxford

Editor's reply: There seem to be many QL readers interested in this subject. We are trying to cater for it with the recent Talk Back* Eliza *program and the new AI* Draughts *series. Perhaps we could cover natural language parsing in the near future. Is there anybody else who would like to see particular areas of AI covered?

Rounding rectified

I am writing about the discussion of rounding numbers and arithmetic precision in the July, 1987 Technical Helpline. I wrote the function because I wished to print small numbers without exponential formatting and to print the results of calculations in programs compiled with Turbo, as they are printed to nine significant figures and what should be an integer result sometimes emerges as .999999999.

The limit of the INT function on the QL is not 32765, as indicated by Colin Opie, because INT returns a real value. The limit of INT is not the limit of the real range — I have found it to be 2.1474836477E9 by experiment. That means that the rnd$ function can cope with a reasonable range of values.

A difference between AH and JS ROMs emerged while writing the function. It was written originally under as rnd(number_to_convert,dp) and it worked perfectly. With the JS ROM, the function name had to end with a dollar sign or a real value is returned — ie., nm_$ is coerced into exponential format for small values.

R.A Robins,
Bramcote, Notts.

```
100 DEFine FuNction rnd$(number_to_convert,dp)
110 REMark maximum dp=6, maximum sig figs =6
120 LOCal number$(20),noughts,abs_number_to_convert
130 IF number_to_convert<0 :nm_$='-':ELSE :nm_$=' '
140 abs_number_to_convert=ABS(number_to_convert)
150 IF abs_number_to_convert>=1E6 THEN
160   nm_$=nm_$&abs_number_to_convert:RETurn nm_$
170 ENDIF
180 REPeat find_max_dp
190   IF abs_number_to_convert*10^dp+.5>2.147E9 THEN
200     dp=dp-1:NEXT find_max_dp
210   ENDIF
220   REMark 2.1474836477e9 is limit of INT
230   number$=INT(abs_number_to_convert*10^dp+.5)
240   IF number$<1E6:EXIT find_max_dp
250   REMark there is no E in the string
260   dp=dp-1
270   IF dp=0:EXIT find_max_dp
280 END REPeat find_max_dp
290 IF INT(abs_number_to_convert*10^dp+.5)<10^dp THEN
300   IF dp=0 THEN
310     nm_$='0'
320     ELSE
330     noughts=dp-LEN(number$)
340     nm_$=nm_$&'0.'&FILL$('0',noughts)&number$
350   END IF
360   ELSE
370   IF dp=0 THEN
380     nm_$=nm_$&number$
390     ELSE
400     nm_$=nm_$&number$(1 TO (LEN(number$)-dp))&'.'
410     nm_$=nm_$&number$((LEN(number$)-dp+1) TO)
420   END IF
430 END IF
440 REPeat remove_spaces
450   IF nm_$(LEN(nm_$))=' ' THEN
460     nm_$=nm_$(1 TO (LEN(nm_$)-1))
470     ELSE
480     EXIT remove_spaces
490   END IF
500 END REPeat remove_spaces
510 RETurn nm_$
520 END DEFine
```

CHANNEL

Bug-eyed criticism

One thing which bugs me is the manner in which listings are printed. Taking the *Pontoon* listing July, 1987, it is a bit of a mess, to say the least. Some lines are printed in over-size print and all the rest are normal. I find that very irritating, particularly because you insist a submitted program is on Microdrive and also a listing.

Presumably it would not be too difficult for you to just use a standard printer, so that all listings could be the same pitch, character, type, and so on.

The only reason I can see for making the present published listings so difficult to read is that you want people to use Microdrive Exchange.

B.C. Spencer,
Al Taif,
Kingdom of Saudi Arabia

Editor's reply: It is true we would like to make an even bigger success of Microdrive Exchange. It is for that reason it is being expanded and including bigger and better programs. What criticism for a single month's artistic fancy, never before and never since repeated.

Served on a plate

We bought our QL from Sinclair when it was launched and have been using it in our bakery for product costing and VAT returns. After seeing your review of the SD Microsystems *Traders pack and Invoicing Program*, we sent for them. We found the Invoicing Program to be just, what we needed but we required more than 10 items and needed to have them calculate the quantity.

We contacted SD Microsystems and it converted the program to suit our needs. It is also now to add a Product and Price into the system which will cut our customers' invoicing and statement work by 50 percent.

Many thanks to SD Microsystems for really good programs at a reasonable price. Also many thanks to *QL World* for without your review we would not have known about it.

J. Hatton,
Maylandsea, Essex

ROM replacements

In the August 1987 issue of *QL World*, Simon Goodwin mentioned the MG ROM and quoted Adman Services as a source of ROMS. I have had many enquiries for the British MG ROM which, although Goodwin did not state it did not exist, he said clearly the MG ROM was for continental Europe.

There is no MG ROM available for Britain as a plug-in-and-go unit. Anyone upgrading will have to be satisfied with a JS and its bugs.

When Goodwin originally wrote the article, I had stocks of German, Spanish and French MG ROMs — MGG, MGE and MGF. I am now down to the last three or four MGF ROMs and have no other source supply. JS ROMs are plentiful at present and an absolute bargain at £18 for the pair.

H.D. Briggs,
Adman Services,
Telford, Shropshire

Defenceless Qdos

Reading Brian Davies' Trouble Shooter in the July, 1987 issue, I am prompted to add two qualifications to his advice. By all means place a single Varistor across the input to the system if that is all that is possible but it should be remembered that in most installations the neutral is grounded at a much greater distance from the point of sale than the earth.

It is surprising how much mess can be propagated along the nominally neutral wire and it is much better to employ two Varistors between line and earth and neutral and earth.

On the subject of lock-ups, I have had my present QL for 16 months — my first blew up spectacularly — and since my interests tend to lie towards number-crunching it runs continuously for long periods. Single runs of a week's duration are not uncommon. I have on occasion suffered lock-up but in every instance the cause was traced to my incompetence as a programmer.

Qdos is defenceless in the face of a determinedly clam-fisted user such as I am. That makes me just a little sceptical about all the talk of spikes. They are certainly not blameless but neither should they be the prime suspects in the event of trouble.

P.H. Tanner,
Glasgow.

Organiser warning

I would like to warn owners of Psion Organiser 2 model xp who have had their Organiser for more than about three months and have only 16K RAM who are thinking of buying the Psion Spreadsheet to take great care. The only way owners of the 16K RAM Organiser can use the advertised 99 row by 26 column grid is to pay an extra £50 for the 32K upgrade which has to be fitted by Psion. That effectively makes the cost of the spreadsheet £89.95 instead of £39.95.

Without that memory upgrade the user is limited to three-figure entry into 950 cells without the use of any formulae. If formulae or headings are used the limit is even worse. Fortunately I discovered the discrepancy very early and was able to return the product and have my money refunded but others may not realise so quickly.

According to Psion, there is no alternative but to get the memory upgrade if you want to use the program fully because the battery powered 32K Rampack, which incidentally you have to discard when the battery runs out because it is not replaceable, cannot be used.

I am not criticising the spreadsheet as a program but, because the latest 32K Organiser has been available only for a few months, the majority of owners will have only 16K models. The above details are valid only if the diary is empty and there has been nothing saved to RAM.

I.M. Fisher,
Croydon, Surrey.

Dated issues

I am hunting for the earlier editions of *QL User* and I am hoping to find someone who has the earlier editions and has no further need of them. In particular I am anxious to trace the alternate month editions prior to February, 1985. If anybody has any of these early copies, could they please contact me.

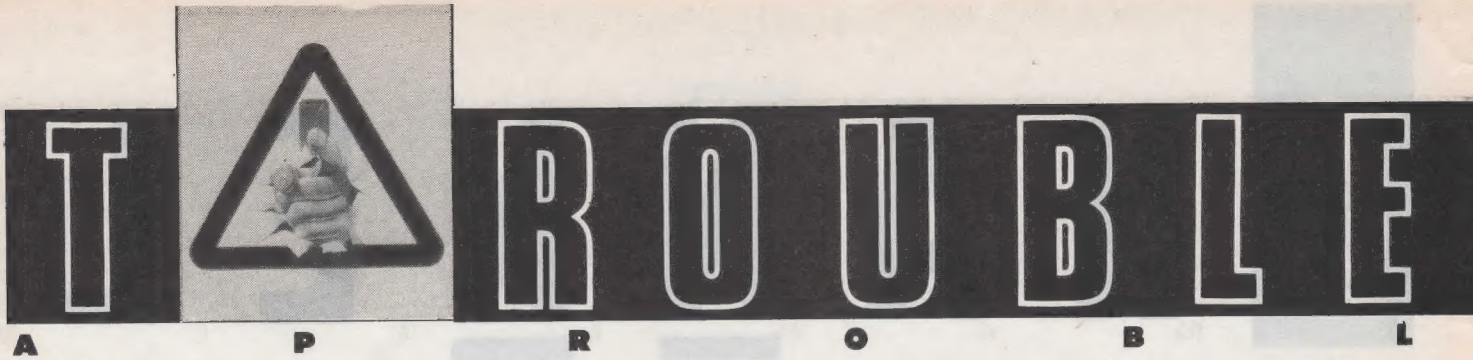
Keiron Salmon,
Robin Hill Cottage
Water End,
Stokenchurch
Bucks HP14 3XQ.

Inkwell delight

May I add some extra information about *Inkwell Deluxe* covered in QL Scene, August, 1987. Being the owner of a serial 8056 printer, I approached the author of Inkwell Deluxe and asked if he could accommodate facilities for my printer in his program. He agreed to do so and the result is two extra features — variable baud rate on start-up and variable printer density mode.

I am delighted with this program and the helpfulness of the author and can thoroughly recommend it to other serial 8056 owners.

R. Brereton,
Clevedon, Avon.



Bryan Davies tackles power surge lock-ups and other consumer problems in his regular trouble shooter column.

My suggestion regarding the sequence in which system units are switched on and off seems to have caused hiccups for some readers. The basic principle that the QL should be protected from power surges caused by the printer or disc drives is reasonable enough but some printers may object to being switched on before the QL. The instructions provided with the units should give advice on the switching sequence; my Kaga Taxan KP-810 (Canon PW1080A) instructions advise switching on and off in the order ‹printer-"other devices"-"main unit"›, where I take it disc drives are other devices and the main unit is the computer.

For convenience all system units are connected to an inaccessible 4-way socket block; I normally switch all units on and off together and have not experienced difficulty with this procedure. If switching on the QL after the printer causes the latter to print spurious characters, set it to "off line" before switching on the QL.

The reason for making comment on this subject in the first place is that the QL has appeared to suffer from being rather delicate — rather too susceptible to the effects of voltage spikes produced by other equipment. The most regular manifestation of this is lock-ups and they are in my experience usually caused by influences *outside* the system e.g., household appliances.

Useless chips

Vast numbers of lock-ups seem not to have any long-term ill-effect on the QL, although they tend to drive the user crazy. Comments made to me by various people have suggested that the printer and display can have a more damaging effect, rendering chips in the QL useless. Having recently had bad experiences with two disc interfaces which appear to have caused three QL chips to blow — at £8 or more each — it seems possible that the effect is felt by the QL through the internal signal or voltage connections, rather than via the mains supply, as is typically the case with lock-ups.

Incidentally, re-setting the QL may well cause the printer to produce a few spurious characters, when the next print is done, if the printer was on-line at the time of re-set; if the next item to be printed has to be a good copy, rather than one to be filed, switch to off-line before re-setting. I have not found switching on all units together to cause any spurious characters with my printer but that does not mean it will not do so with other types.

One potential source of trouble is the EPROM in a disc or memory interface. An interface bought years ago may prove incompatible with a recently-acquired program or disc drive unit. Even if the interface manufacturer seems to have disappeared, it may be possible to get the EPROM updated to get rid of the problem. The TR interfaces of which I wrote in a previous article have been updated to version 1.18, with the help of Tony Tebby. Try contacting Care Electronics.

Irresistable

A good place to obtain information is a Microfair; the last two were very well-attended by QL suppliers and users. Be prepared to spend money, though — some of the reduced prices are difficult to resist.

Delays in receipt of ordered goods can be due to a variety of reasons, but they can be slow, especially if you live overseas. It takes typically two weeks for a U.K. cheque to clear and a non-U.K. cheque may well take a few weeks longer. Allowing a minimum of one week for return postage, that means goods are unlikely to arrive less than one month from the time they were ordered. If a supplier sends goods before a cheque clears you are lucky because even in our small QL world there are some dishonest people. Statistically, the chances are that there are more of them who are users than suppliers, because there are only two dozen fairly significant suppliers in the U.K., whereas there are perhaps 30,000 active buyers on their lists.

The postal service is a convenient whipping-boy for anyone wanting to cover inefficiency but there are genuine reasons for complaint in recent months. The dispute in the Post Office about the employment of casual labour has been continuing for months and caused considerable delays to mail in central London; the area spread to east London and Essex, where some postboxes were sealed. There may be delays in Kent also. Several well-known QL suppliers operate in those areas and there will be many users suffering delays.

A good example was my order for a Trump card; not having received it within a week — I live in the same county as the supplier — I was told another was being sent. The first arrived 10 days after despatch, the second had not arrived 12 days after despatch. A letter sent from a remote part of the Bahamas the day after the first Trump was despatched arrived the same day as it and mail to and from the U.S. is always slow; an air mail parcel from Baltimore took almost four weeks to arrive.

You can be reasonably certain that any program or piece of hardware which has become a household name has had sales running into thousands. Even relatively obscure programs may sell in thousands per year. Two new introductions at the May Microfair look to have sold in the hundreds — perhaps more than 1,000 in the one case — within two months. While many suppliers sell competing products and will obviously not say bad things about any of them, some may be willing to indicate which products they think are the best buys for your purpose.

Faulty returns

The returns rate, the percentage of goods sent which are returned as faulty by customers, should be well below five per cent but I have several times been told that it is as high as 30-40 percent for some products. Such products will not make the supplier money, because any profit will be swallowed in the cost of sending replacements and dealing with complaints. It is therefore in the interest of suppliers to direct you towards items which are likely to work; if you are turned away politely from something you want, consider that the supplier may be doing you a favour.

SHOOTER

EMSOLVED

Microdrive cartridges are always a talking point. I am told that Sinclair, in some form still collects a royalty on each new cartridge produced; the figure quoted is 70 percent so do not be surprised at having to pay more than £1 per cartridge. The ratio of storage space/cost for 3½in. discs is about five-sixths better than for cartridges and they cause considerably less trouble. Having just consigned one cartridge to the waste pile and put a question mark on another, after a few hours' work, I have no regrets about having paid for disc drives two years ago.

Responses

T. W. Tran asks if anyone has a copy of the original games cartridge supplied at one time with new QLs, as Dixons reformatted his copy.

J. G. Dent otained a small claims Court judgement against 4 Systems in July last year but has just been notified that "the judgment debtor has left the address given, leaving no saleable goods". He makes the point that to pursue the matter legally a name of one of the principals is needed and other readers may have such a name from correspondence with 4 Systems in earlier days.

The West Yorkshire Trading Standards service advises that Printerland no longer operates from 156 Longwood Gate and its director **A. I. Richardson** has advised that trading ceased in September, 1986 and the business has no assets. In answer to the complaints of **K. Baskaran** and **B. N. Hardie,** Richardson commented that "a display screen was sent to Norway and got lost", and that it has never sold a printer feed mechanism for between £50 — £100; the latter comment relates to the estimate I gave of the price of an Epson tractor feed which was not supplied.

Sandy has stated that all deposits received for the future were returned earlier this year by recorded delivery. Cheques sent with orders were never banked and the potential customers should have received their cheques by now. Will **James Pollitt**, New Zealand, please let me know if he still feels his deposit has been lost? Sandy has asked the Post Office to check on this item.

Orders for the Futura are not being accepted at present and release of the machine will not be "before the end of this year". PC users will be interested to hear that Sandy is first introducing a PC68K board, which puts a Futura on a single, multi-layer, standard IBM-sized expansion card for PCs or clones.

What must worry many potential buyers is the time the Futura story has run; although Sandy appears to have behaved reasonably in respect of deposits, the ever-receding delivery date for the new computer is cause for misgiving, to put it mildly. There appears no good reason to believe the promised computer will ever be available. CST might well feel that the carrot of a cheap 68020 computer is preventing some people buying the reality, the Thor 20, because the original price quoted for the Futura was so much lower than the current price of the Thor 20.

Sales of the Thor 1 may have been affected also. You cannot quote a realistic price for a computer which is years away from production and there is no point in hoping for Amstrad prices on a 68020 version of the QL, unless that company sees fit to re-introduce the QL in this form and anticipates a sales volume, which does not look reasonable at present.

Version 6

With reference to previous comments on the problems of **J. Pemberton-Bates,** Sandy reports, that his Q-XT640 was completely updated free; Tony Tebby has produced Version 6 software for it to allow it to run with QRam and the pointer enviornment. The reported problems may have been solved. Other Q-XT640 owners should also have had updates if they bought QRam and mouse.

Replies to readers' complaints have still not been received from **Byteback, W.D. Software and Xenon**, although reminders have been sent. If I were treated that way as a customer I would be getting unhappy by now. Has anyone succeeded in obtaining the **QL Dam in 3D** program advertised by **Persoft** in the May *QL World?*

Eidersoft also has not made comments on certain letters but it has at least been in contact concerning others. By the time you read this, Eidersoft operations should have undergone reorganisation. The Atari side of the business may be separated from the QL side. It is to be hoped that response to customers' queries is speeded. The support staff at Eidersoft certainly try to help individual customers but seem inundated with requests.

What will interst a few users is the future of the Eidersoft Support Scheme. Much money must have gone into it but it is doubtful if many members will feel they have received their moneys-worth of support from it.

No incentive

Another question mark is about the future of programs — *Ice, QSpell, Choice, Iceberg, Icecube*. Ice and QSpell have served many users well but they badly need updating and there has been no sign of willingness to do that job. With *Spellbound* on the market and the initial version likely to be upgraded, there is not much incentive for anyone to improve QSpell, even though there should be a market for a non-concurrent but multi-tasking spelling checker.

The situation for Ice is worse; with *Taskmaster, QRam, Swopper* and others offering more facilities it would be rather late to upgrade Ice. I think there is a market which is not really filled by the other programs on offer. Those who like the icon/mouse way of doing housekeeping—it is used on many office computers in a similar way to Ice—might be willing to pay for an upgraded Ice.

Such users are probably dissatisfied with the way some other programs are aimed mainly at computer buffs. Adding the full wildcard features, using the desk-top more sensibly — e.g., getting rid of the poor calculator and calendar and using the space for more files, separate icons for flp1, flp2, perhaps a larger file-viewing window, providing screen-dimming, key macros, Caps Lock indication and memory indication. Perhaps some of this will appear in the Thor 20 as it is developed but it is likely to be in the Thor operating system and not applicable to the QL. Two new programs, Iceberg and Icecube are being tested and may be almost ready for release when this article is published.

Battery Back-ups

To crash or not to crash that is the question Ron Massey supplies some answers

Contrary to popular misconception, the QL is neither more nor less susceptible to mains noise, where the sine wave produced by mains alternating current is overlaid by a spurious voltage, than any other computer system. The QL is, in fact, surprisingly immune to the effects of electrical equipment being switched on or off, such as freezers, refrigerators and vaccuum cleaners.

As an aside to the main intention of this report, mains spikes — the noise generated by equipment having intermittent heavy current requirements, such as arc welders, or motor starting systems — can produce voltage noise well in excess of the normal 240v standard.

There would seem to be an almost universal reluctance to provide an adequate working environment for almost any type of equipment. Having bought a QL, a viewing system of some kind, a printer and, possibly, disc drives, many users seem to think they have everything they need.

One of the true stories which brings to light the importance of ensuring an adequate supply of quiet, uniterrupted power for computers happened to Harry Harrison, the famous science fiction author, some years ago.

Small drop

Residing in a remote region of Ireland, his electricity at the time was supplied mainly by generator. One evening, he was working at his computer when one of his guests paid a visit to the smallest room. The guest pulled the chain a voltage drop occurred and his computer crashed, losing hours of work in the process.

A number of options are available which provide various degrees of protection against problems arising from other electricity consumers who may be sharing a common electricity source or suffer from unexpected loss of power, however briefly.

One of the barriers inherent in computer power supply designs against problems caused by voltage fluctuation is that the majority of computers have a transformer or some kind of electronic switching system separating them from direct contact with the mains and are protected further by some kind of a voltage regulation system. Transformers in particular filter some types of minor electrical noise successfully.

Users suffering from inexplicable computer crashes, where electrical noise may be the principal contributor, may find that the simplest and least expensive cure is a mains filtering system such as Tony Firshman's Computer Cleaner.

Cleaner filters-out most of the various nasties which can occur in mains electricity, where supplies in excess of 600v are common occurances. Fortunately those over-voltages are not usually sustained and, while not particularly desirable, can usually be ignored for the majority of electrical appliances.

Earth disturbances

Generally, electrical disturbances are divided into two classes — Common mode, where disturbances occur between supply lines and earth; and Series mode, where disturbances occur between line and neutral.

As viewed from the perspective of the standard 240v of alternating current, transients, a natural by-product of the distribution and use of electrical power, usually take the form of spikes of current overlaying the mains.

Electrical noise can be attributed to a variety of causes and include air conditioners, photocopiers and, especially, some types of lighting dimmer switches, if operated in close proximity to computer equipment.

British Telecom, whose equipment is to a large degree voltage-sensitive, has measured peaks well in excess of 1,400v, lightning strikes can produce mains transients in excess of 3,000v.

Computer Cleaner clips poiwer in excess of 630v at a peak current of up to 1,200 amps, a peak response of roughly 750kw. It also filters-out radio frequency noise up to 130Mhz. The important aspect of the performance of this type of system is the time it takes to respond to rapidly-changing conditions on the mains.

Putting Computer Cleaner on a test rig supports its claims to being an effective and efficient design. If anything, test results suggested that the advertised specifications were a little on the conservative side. Response time to mains variations is somewhat better than the 10nS advertised.

Available in three configurations, Computer Cleaner is sold as an outwardly-appearing standard 13-amp plug, a three-way adaptor and a 4-way trailing strip of sockets.

Blackout

The other problem commonly experienced by computer users is the under-voltage — called brownouts — which can occur when electrical applicances requiring large amounts of current, however briefly, are switched on. Longer-term and even more disastrous effects are experienced with breaks in the power supply — a blackout.

A new product, designed and manufactured in the UK, is a QL battery backup power supply from the Devon-based company, Frequency Precision. This particularly economical backup system is wired between the QL transformer and the plug which connects to the back of the QL.

Installation is made by cutting the wires at a conventional position, about 9in from the QL plug and connecting them, as indicated by the colour coding, to the unit's screw connectors which are correspondingly colour-coded; no soldering is required.

Three diodes

The front panel consists of three light emitting diodes above a control switch. When mains is available, regardless of the position of the switch, the left LED (green) is lit. If the three-way rotary switch is in its anti-clockwise position, connection from the QL power supply is direct, bypassing the unit's batteries.

If in the central position, the QL is connected to battery power, the batteries are placed on a trickle charge

and the central yellow LED is lit. The right-hand position places the batteries on high charge and the red LED is lit.

The QL power supply provides a nominal 9.4v DC and 15v AC. The Frequency Precision battery backup will power the QL, Microdrives and RAM expansion for roughly one hour at 7v. That should give ample time to save and data and/or programs until mains power is returned.

The 15v AC required for the RS232 drive is not supplied by the backup and a printer or other equipment connected to the serial ports will not be available during a blackout.

In addition to providing services as a power reservoir, the unit acts as an efficient, very large mains electricity filter. Because the QL is operated at a nominal 7v — measurements ascertain the actual output voltage is consistenly between 7.5 and 8v — when switched to battery backup, the QL internal voltage regulator does not have to work so hard as it does with a nominal voltage input and, therefore, operates at lower temperature.

If your QL is entirely Microdrive-based the Frequency battery backup works extremely well and could save valuable data which would otherwise be lost in a brief moment of mains failure. However, disc-based users should be aware of an additional potential problem.

When a loss of power occurs, it rarely switches off cleanly. During a power loss it is possible for corruption to occur through the QL connection to the disc system, possible causing data corruption, also possibly causing the QL to crash.

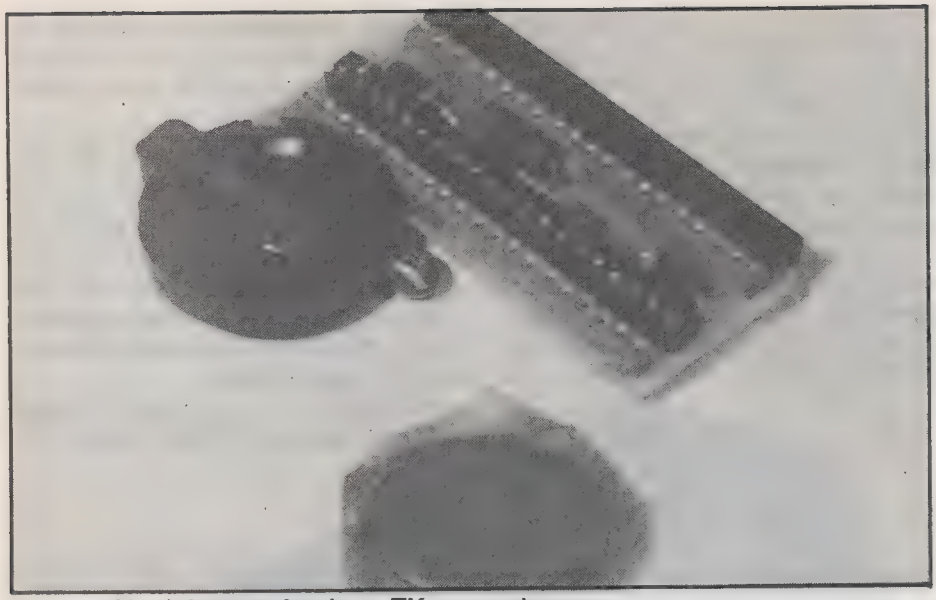
While testing the battery backup, I found that unless the disc drive power supply was filtered, the act of pulling the QL power plug from my 4-way socket strip — unfiltered — caused sufficient interference to produce a crash. Putting one of the Firshman plugs on the disc drive mains lead cured the problem.

From the point of view of serious users and software houses, it is vital that adequate provision is made to ensure that an uninterrupted supply of power is available. In terms of both price and specification, the ultimate answer is a voltage invertor, a device which transforms DC battery power into AC mains voltage.

Available for a long time, the most common types of invertors operate in stages by first converting DC battery power electronically into low voltage alternating current at a nominal 50Hz frequency. This is then passed through a transformer, stepping it up to a nominal 240v. Power output varies with invertor design and invertors are available rated from a few watts to several hundred watts.

One of the common problems associated with standard invertors is that, to keep their prices as low as possible, the system used to convert DC into AC is done by voltage chopping, switching the DC on and off rapidly.

While this method provides mains power which is adequate for most purposes it usually produces mains with a mostly square-wave output which additionally may include harmonics, multiples of the standard 50Hz output which may, in turn, affect the output frequency. Most inexpensive invertors do not include AC processing



Above: Clock battery backup, TK computerware

or filtering.

Galatrex International supplies a range of dedicated invertor-type power backup systems designed for use with small computer installations ranging from 250 watts (300KVA) to 10KVA output for all practical purposes, 10KVA, derived by multiplying the voltage by the amperage, is very roughly equivalent to 19kw.

The Galatrex 300VA unit is delivered in a 140mm × 200mm × 245mm box and includes three 13-amp outlets and an off/on switch on the front panel. Batteries are mounted inside the case and, depending on drain, can supply power for up to an hour — more if larger batteries are used.

Having battery backup systems applies to virtually every aspect of equipment relying on a continuous supply of power for preserving data integrity. The QL, in common with many other computer systems, was designed to include a provision for battery backup of other more specialised parts of its system.

Crucial time

If you are using a toolkit which supports file date-stamping, having the QL clock set for the correct date and time is of crucial importance. If for no other reason you will have a permanent record of the last time a file was updated. Looking back through archived records is much simplified if you have an exact record of when a file was produced.

Although the QL does not natively include a facility to date-stamp files, a number of toolkits, such as *Super-Toolkit II* — available as both an add-on, in either EPROM or software forms, and as an integral part of most of the better disc interfaces — are available which provide this facility.

Setting the date may be done manually by typing "SDATE year, month number, day number, hour, minute and seconds". You can also obtain a number of utilities which, while not making the process simpler than it already is, provides a little more visual interest.

Many programs, such as *Taskmaster*, include a facility to set the clock during the start-up process if the date differs from the last time the program was used. Most other computer systems include some form of battery back-up for their integral clock systems. Where a complex system may include a high-capacity data storage device, such as a Winchester, having a dated record of its many files is vital.

Sinclair Research originally intended to include a battery back-up system for the QL clock but, for reasons which are now history, never completed the project. I understand that, at one time, a mountain of batteries stood in the SRL warehouse as mute testimony to intentions in that direction.

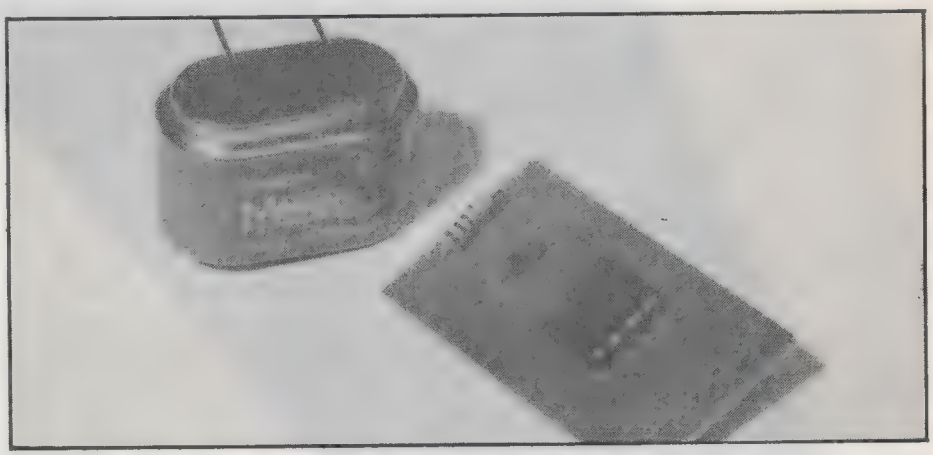
Two types of battery-backed clock are available for the QL. While performing the same function, each has its own merits to commend it. The first, from Rainbow Digital Repairs, uses a re-chargable nickle cadmium battery and a chip, mounted on its own PCB, used to select either a charging state, when the QL is powered-up, or a discharge state when the QL is switched off.

Five connections from the small printed circuit board to the QL are required and, while it may be installed by the end-user, installation requires a large amount of knowledgeable expertise, if serious damage to the QL components is to be avoided.

The back-up PCB may be installed in any spare place inside the QL but is usually fastened with double-sided tape to the top of the EPROM socket. The battery, also fastened into position with double-sided tape, fits well into the space separating the inside vertical back of the QL case and any card which may occupy the expansion port on the left side of the QL.

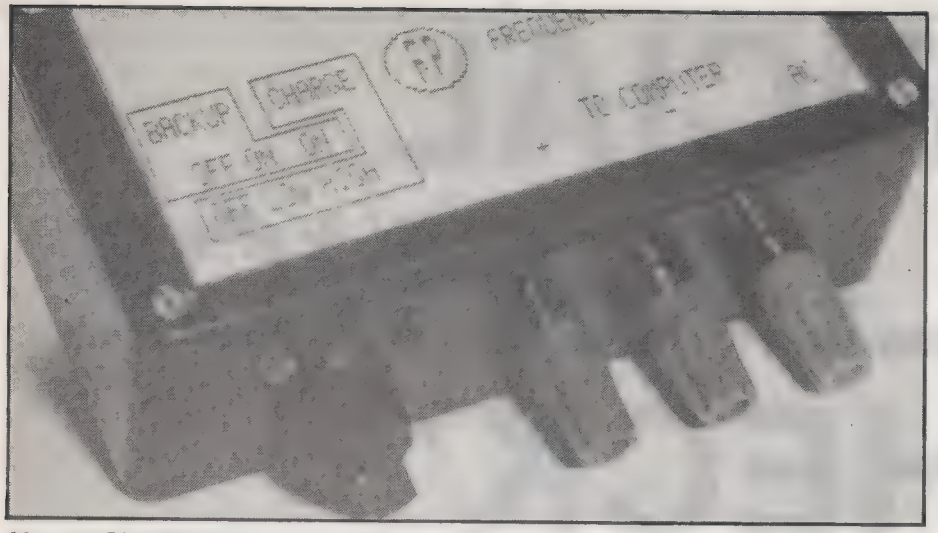
TK Computerware supplies a battery back-up system for the QLs clock which takes a different design approach, requires no soldering and uses a non-rechargeable, long-life, disc-shaped lithium battery as its power source.

The unit is installed by extracting the ZX8302 chip — carefully located near the serial ports — from the QL PCB and installing the unit in its place. The 8302 chip is then re-installed in the socket on top of the unit and the battery is placed in its retaining clip. Because of miniscule power requirements, battery life might reasonably extend to two years; afterwards it must be replaced.



Above: Clock battery backup, Rainbow Digital

Choosing which of the two clock back-up systems you may wish to use is a matter of personal preference. The TK battery back-up is the easiest to install but eventually will require servicing to replace the battery. The Rainbow back-up requires more careful installation but the entire unit does not intrude into any area needed by other internal perpherals and installation is a one-off



Above: QL battery power backup

Users should be aware that having a battery back-up system on the clock is no guarantee that its setting will remain inviolate. Some types of corruption, whether due to program failure or where the power of a QL fails for any reason, can cause the clock to revert to its random-appearing state. Also a few programs still insist on re-setting the clock for their own purposes.

Overall, users should consider the various aspects of the provision of power for computers within the framework of a complete picture. If you take your interests in computing seriously, it follows that you should guard against loss of valuable work caused by interference from sources beyond your control.

process.

To a large degree, however, the choice will be determined by other internal add-ons you either have or may wish to incorporate in the future. If, for example, you are likely to add Qimi, the QJump internal mouse interface upgrade to your system, you will need to use the Rainbow battery back-up. Stacking multiple layers of add-ons is, at the best of times, highly inadvisable; the Qimi installation, also not requiring soldering, displaces two chips, one of which is the 8302.

Product: Computer Cleaner **Price range:** £14 to £24
Source: Tony Firshman Services, 12 Bouverie Place, London W2 1RB. Tel: 01 724 9053.
Product: Computer Battery Backup **Price:** £54
Source: Frequency Precision, Hillsview, Aller Road, Dolton, Winkleigh, Devon EX19 8OP. Tel: 0805 4381.
Product: Voltsafe **Price:** from £695
Source: Galatrex International, Scotland Street, Llanrwst, Gwyneed LL26 0AL. Tel: 0492 640311.
Product: Battery Backup Clock **Price:** £17.95
Source: Rainbow Digital Repairs, Clark House, Haxby, Yorks YO3 8HU. Tel: 0904 768853.
Product: Battery Backup Clock **Price:** £19.95
Source: TK Computerware, Stone Street, North Stanford, Ashford, Kent CT25 6DF. Tel: 0303 812801.

ARTIFICIAL INTELLIGENCE 'IN CHECK'

In this issue Marcus Jeffrey begins a series of articles, detailing the development of a program designed to play a strategy game such as draughts

In the next few months we will develop a SuperBasic program to play the game of *Draughts* — or Checkers. The development of the program, which is a fine example of how to develop a program to play any strategy game of this type, will be explained in detail. The program will take many features from the classic Draughts program written by A.L. Samuel in the late 1950s and early 1960s.

The program developed in the magazine will play a reasonable game but is not intended as a commercial product. Consequently graphics and such will be kept to their basics but the modular design and detailed explanation should enable any competent programmer to add, say, a three-dimensional board, user-friendly input routines and so on. On completion of the series, an enhanced version of the program will be available through Microdrive Exchange.

Before embarking on the initial design phases and data structures we will take a look briefly, at the features to be included in the final version. The main feature of any program of this kind, is the Evaluation Function, a routine, or more usually a series of routines, which assign a point score to a position. That is essential if the computer is to be able to tell whether a move leads to a good (better) or bad (worse) position.

That works in the same way as a human player might judge a position. If you were playing a game of chess and chose a move which left your queen "en prise" — ie., in a position of immediate capture — it would seem reasonable to judge the position to be bad for you, though very good for your opponent.

Subtle factors

Unfortunately very few positions are so clear and much more subtle factors come into play. In chess they might include centre control, pawn structure, material balance, attacks and defences, king position, pins and so on. Although a human player may be able to look at a position and make a few imprecise judgments on its value, a computer has to be much more logical in its approach. Consequently an evaluation function is used. It will assign scores to all the features of the position which are felt important.

In Draughts, those features might be centre control (CC), forks (F), material (M), threats (T) and so on. Those features will then be combined into a collective score for a position. It may be that some features are more important than others, so weights are used. The final evaluation will be along the lines:

$$f(Eval) = (w1 * CC) + (w2 * F) + (w3 * M) + (w4 * T) + \ldots$$

There is another reason for using external weights rather than modifying the range of scores returned to the evaluation function by the various functions designed to score each feature. That is the ability for the program to modify its own play, at which we will look later.

Once the evaluation function has been added to the skeleton program we are in a position to play a game against the computer. At that point we would not expect it to play particularly well. One of the main reasons is its lack of foresight. Human players would not only consider the position in which they are but also the one once they have made their move. They would also take into account the consequences of the move and the resulting possible positions once their opponents has moved.

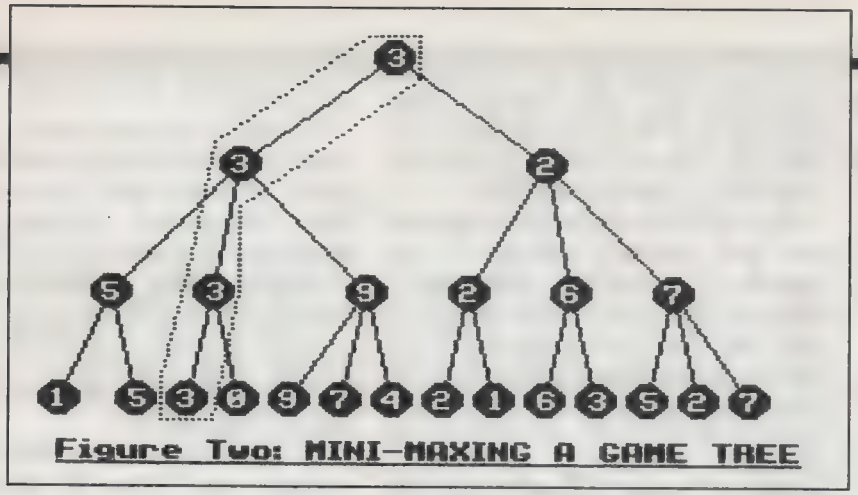


Figure Two: MINI-MAXING A GAME TREE

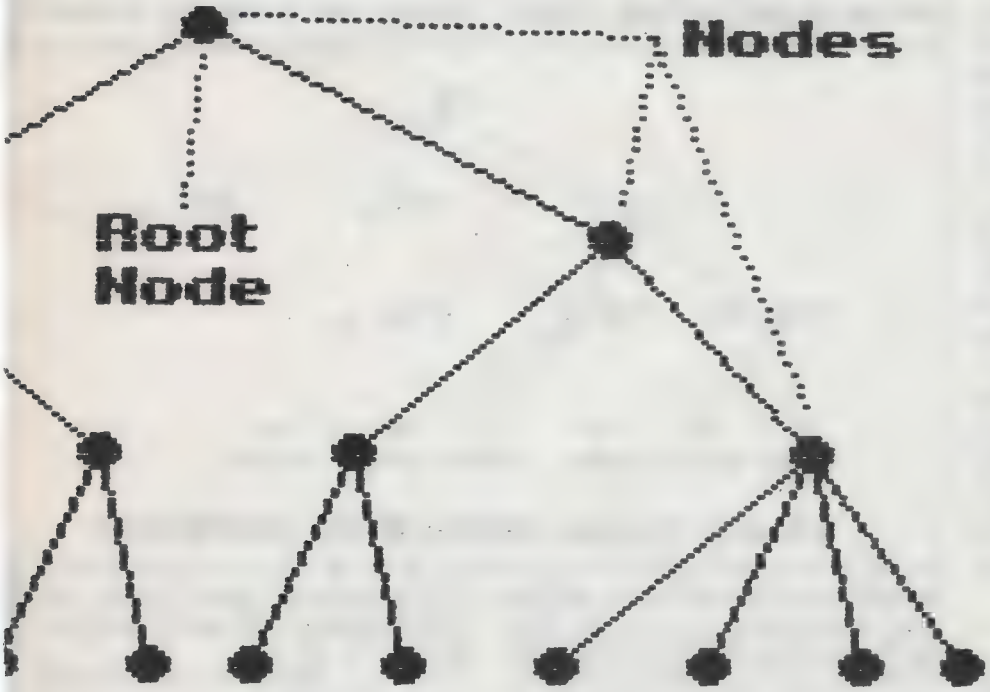


Figure One: TREE STRUCTURE

They might then consider the possible replies to their opponent's move and so on.

The computer performs that operation using what is known as a "game tree", "mini-maxing" scores to find the best move. A tree structure in computing is a data structure which represents an inverted tree — figure one — similar to a family tree. Data is held at each "node", with parent nodes and child nodes, as you might find in a family tree.

Tree root

We can represent a series of moves in a game using this structure. The root node — top of the tree — is assumed to be the present position and all the branches to the child nodes are the possible moves which can be made. From each of those nodes the next level shows the moves possible by the opponent and from those the branches represent your replies to your opponent's possible moves.

Each extra level of the tree is known as a "ply". Thus a search which considers your moves, your opponent's replies, and your possible moves from those replies would be a "three-ply" search.

Obviously, in an ideal world, the computer would search through a large number of ply until it reaches the end of the game along every possible branch. At that point it would be able to play perfect moves and always win. Unfortunately the tree expands exponentially.

Assume we are searching a tree for the game of chess, which has an average of about 30 possible moves from any given position. At the first ply we would have 30 terminal — bottom of tree — nodes to search, at the next ply that would be 900 (30 × 30), at the next level 27,000 (30 × 30), 810,000 at the next level and so on. When you consider that an average game of chess will last, say, 40 moves, you can imagine that this kind of method would take a long time.

Consequently game-playing programs will search to a particular depth, then apply their evaluation function to the positions represented by the terminal nodes of the tree. A system known as mini-maxing is then used to backtrack through the tree with the scores and finally decide which move to make.

Mini-maxing assumes that the evaluation function will return a high score for a good move for the computer and a low or negative score for a good move for the opponent. If we look at the three-ply search in figure two, the scores shown at the bottom — terminal nodes — are those given by the evaluation function for the positions represented by these nodes.

Now the branches between the previous level — two-ply — and the terminal level are for moves made by the computer when it will be trying to maximise the evaluation function score. Therefore the highest score from each of the terminal nodes is copied to the appropriate parent node. That gives us a set of scores in a two-ply tree, ignoring the terminal level.

Lowest scores

As the branches to the second level represent moves made by the opponent we want to minimise the evaluation function scores. Remember that, the lower the score the better it is for the opponent and the worse for the computer. So, in the same way, we copy the lowest scores to the one-ply level.

Again, it is the computer's move, so the highest score is copied to the root node. The route shown by those scores, ringed by the dotted line, shows the sequence of play expected for the next three moves. That, of course, assumes that the opponent will play the move which the computer thinks is best for the opponent.

There are a number of modifications to this basic tree search algorithm which serve to improve matters. To begin, it is rare for programs to search to a fixed depth and then stop regardless of the situation on the game board. Most programs instead search to a fixed depth of, say, five-ply, then continue their search along any "active" lines until a quiescent position is found.

A quiescent position in this kind of game would probably be defined as one in which no captures were possible. In the game which we will develop, captures are forced — ie., must be made — so they will be played out through the tree and the terminal node will then be the

ARTIFICIAL INTELLIGENCE 'IN CHECK'

position at the end of this sequence.

Another feature which will be developed is the alpha-beta algorithm. It works on the principle that once a reasonable move has been found it is not worth examining obviously inferior sequences. Imagine that we are developing a tree, such as the one in figure three. Only part of the tree has been shown, because, rather than holding all the positions in the tree, it is often the case that programs will hold only one position at each depth, discarding it when another position is required at that depth.

That saves a good deal of memory and is almost as easy to program as the memory-greedy method, especially using recursion techniques which we will examine when developing the program.

Let us assume that the program has evaluated the terminal positions P111 to P11n and found that the largest score is, say, nine. It can immediately mini-max that score to position P11. Continuing with the tree search, the program will start expanding positions P121 to P12n.

Node value

What happens if one of these nodes returns a score larger than nine? A score larger than nine will be mini-maxed to position P12 and the search will continue. When the opponent is trying to minimise the score, when mini-maxing the scores from positions P11 and P12 through to P1n, he will definitely not choose the node with the value larger than nine.

Commonsense tells is that the value nine is less than any values greater than nine. Consequently, when expanding the positions P121 to P12n, the computer can stop and discard the remainder of this portion of the tree as soon as it finds a score larger than the previous best score — in this case nine. A similar effect works at the next level up, where the opponent's minimum scores are mini-maxed and sections of the tree can be discarded if a value, which in this case must be less than a previous one, from a mini-maxed position is found.

The alpha-beta algorithm derives its name because two values, alpha and beta are set to minus infinity and plus infinity at even and odd ply respectively. Those values act as a range of acceptable values for the search to continue and they are replaced by evaluation scores, as they become available, to reduce the range.

The use of the alpha-beta algorithm can give massive savings in the amount of game tree seached. If positions initially are sorted so that the most likely best moves are examined first the alpha-beta algorithm will prune even larger sections of the tree. Typical figures indicate that if a tree for, say, the game of chess is searched in optimal order to a depth of four-ply, the alpha-beta algorithm will reduce the search by a staggering 99 per cent over the standard mini-max method.

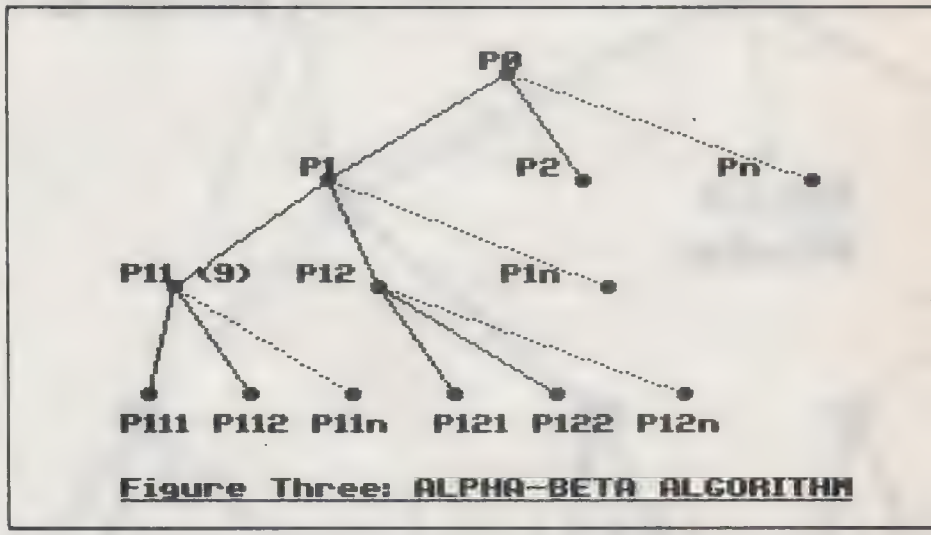


Figure Three: ALPHA-BETA ALGORITHM

Naturally we rarely expect any savings even approaching that kind of figure but the pruning is still very significant and well worth the additional programming.

Another item which Samuel incorporated into his program was a self-modifying evaluation function. Each feature of the evaluation function was given its own weighting. As the program played games — for instance, against itself — it "tuned" those weightings so that the more important features were given higher priority and some features were discarded completely.

Polynomial procedure

The difficulty is how the program should choose whether a particular feature is significantly more important than any other. Samuel used what he called a Polynomial Modification Procedure. It used the difference between a mini-maxed score and the score when a position is encountered to modify evaluation feature weightings. Samuel took the view that if the evaluation feature was well-tuned, both of there scores would be the same. Consequently any differences between them could be used to modify the weighting either positively or negatively.

Samuel's program also used a method of rote learning, where it saved board positions and scores as they were encountered. Because of the slowness of access from both Microdrive and discs — without extensive hashed random access programming — this feature will be included only for people with expanded machines, where a RAM table of previous positions can be stored.

In addition to the time-saving through not having to evaluate a position — it can be accessed from the table — this storage method can improve play. To see that, imagine a simple program which always looks ahead three-ply and saves the position and score.

In a later game, when evaluating a terminal node at a depth of three-ply, the program may find the position already held in the RAM table. In effect, that has already been evaluated at three-ply, so when the present positional scores are mini-maxed, the root node could be saved with a score to a depth of six-ply — the previous three-ply plus the present mini-maxed three ply.

In a still later game, the six-ply position may be used and so on. This method is a very slow form of learning. Nevertheless, the program is building a library of deeply-analysed positions without ever mini-maxing beyond three-ply.

Naturally for rote-learning to be used, numerous other routines must be written for saving and loading positions, housekeeping to ensure that only the most frequently-encountered positions are kept, fast access routines, and so on.

• In next month's article we will develop the skeleton framework of the program, including the board representation and move generator.

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Super BASIC PART II

Mike Lloyd continues last month's theme of software development with a close-up view of planning a structured SuperBasic program.

The top-down programming strategy explained last month exploits two essential features of structured programs, modularity and hierarchy. The top-down technique involves starting with an outline of an idea and breaking it into ever-more detailed segments. The programmer eventually has a hierarchy of modules, each well-suited to becoming a user-defined procedure or function.

Other planning techniques could be used to arrive at that stage, some of which will be covered later in the SuperBasic series, but whatever overall strategy is used the next steps are to plan the individual program modules, code them, test them and integrate them with the other constituents of the program. When the program has been completed it needs to be documented and kept updated. This month's article covers all those stages in the life cycle of a program.

A useful *aide memoire* when writing a substantial program is a list of all the variable and procedure names used in the program. The *global name table* should be updated throughout program development and retained with other documentation for reference. As well as avoiding conflicting uses of variable names, the table aids the understanding of unfamiliar listings, provided the purpose of each variable is recorded. Large or complicated modules might need supplementary name tables. A typical table layout appears at figure one.

Choosing names is a matter of personal preference but verbose. Many programmers develop glossaries of names which they use for similar purposes throughout their programs, thereby giving them almost the status of system variables. For example, the command *REPeat LOOP* is seen so often that novice programmers might mistake *LOOP* for a SuperBasic keyword. Other favourites are *XPOS* and *YPOS* for co-ordinates and *CHAN* for a channel number.

The purpose of variables can be made clearer by adding prefixes or suffixes to denote their purpose. Thus screen co-ordinates might begin with X or Y, e.g., *Xblock, Yblock;* data pointers might end with _p%, and ASCII values might end with _key.

With a skeleton name table to hand and the pre-planning stages discussed last month completed, the next step is to begin coding the program. A properly-structured SuperBasic program will in most cases consist entirely of user-defined routines which could be written in almost any order, so where should coding begin?

One option is to identify the *root* module in the program plan hierarchy — i.e., the one at the very top of the hierarchy from which all flow lines stem — code it and then progress through the most important "mainstream" modules in the order in which the interpreter is most likely to encounter them. Once the core of the program has been written, interactive testing can begin at a relatively early stage in the programming process and subordinate definitions can be written which meet the requirements of the mainstream routines exactly.

When writing a module its type and its name must

SUPERBASIC PROGRAM NAME TABLE - © Mike Lloyd 1987

Program Title: 3D-GRAF..... Date Commenced: 4..Mar..87.....

Description: Produces EASEL compatible 3dimensional block graphs.

User Definitions

Line No	P/F	Name	Parameters	Notes
100	P	INIT	—	Set screen and arrays.
200	P	MENU	—	Show menu options + read choice
300	Fn	GETKEY	start, finish	Return ASCII value of Keypress if between START and FINISH
400	P	SCALEX	colmax rowmax height option	Calculate graph scale No of columns displayed No of rows displayed Assumed height of viewing angle Display option (1–4)

GLOBAL VARIABLES

Type	Name	Notes
FP	key	ASCII value
FP	Col	No of columns
FP	Row	No of rows
INT	Opt%	Display option
$	Title$	Display heading
FP	Height	Pixel height of block

Type	Name	Notes

ARRAYS

Type	Name	Dimns	Notes
FP	INFO	Col, Row	Holds true values to be displayed
$	COLNOTE$	Col, 1Ø	Holds column headings
$	ROWNOTE$	Row, 1Ø	Holds row headings

•Figure one How to fill out program name table

be decided. Many routines can be written equally well in SuperBasic either as functions or procedures, although more discipline might be required if a program is destined to be compiled. In theory, procedures should not change the value of parameters but SuperBasic breaks this rule with both the INPUT and the READ commands. Programmers usually can ignore the rules without complaint from the SuperBasic interpreter, although purists might comment about poor style. Module names, like variable names, should be brief and meaningful and their readability is improved further if function names are nouns and procedure names are verbs.

Parameters

The next stage is to define the module input and output parameters and conditions. That might be as simple as recording that a routine works only with string parameters, or that it presumes that a particular channel is linked to the printer, but in some circumstances the limitations may be more complex. Generally, the fewer assumptions made by a routine the fewer opportunities there will be for errors to creep in and those which are unavoidable should be recorded alongside the program name table.

Unfortunately, SuperBasic is unhelpful in this respect because it is not possible to detect such things as the current CSIZE values or window attributes without resorting to peeking system variables. Figure two shows a typical record of program assumptions.

Many modules can be written and modified on-screen without pre-planning but more complex routines will need to be planned as carefully as the program. The design of programs, or parts of them, can be represented by flowcharts, structure diagrams and pseudo-code. Those methods will be dealt with in detail in a later SuperBasic feature but for now pseudo-code, the method usually accepted as the most suitable for program planning, will be introduced,

Pseudo-code is a form of note-taking which uses Basic keywords in a non-rigorous way. There is a pseudo-code definition of a simple procedure which prints text in any size window without breaking individual words:

```
DEF PROC write (text)
    IF no breaks in text
       PRINT text
       RETURN
    ELSE
       PRINT !next word!
    END IF
END DEF
```

Pseudo-code should be simple enough to write quickly and detailed enough to make translation into SuperBasic uncomplicated; it is generally easier to understand pseudo-code than the equivalent SuperBasic listing. Keywords usually are written in capitals and non-reserved keywords in lower-case; only essential punctuation is used. When programmers are writing for convenience the conventions adopted are immaterial so long as they are consistent and clearly meaningful. When pseudo-code program plans need to be understood by many programmers, however, it has to be more stylised.

Computer dialect

PDL, the Program Description Language, is one attempt at regularising Basic patois but its weakness is obvious. If it is regular it can be turned into a computer dialect, thus defeating the object of having pseudo-code in the first place.

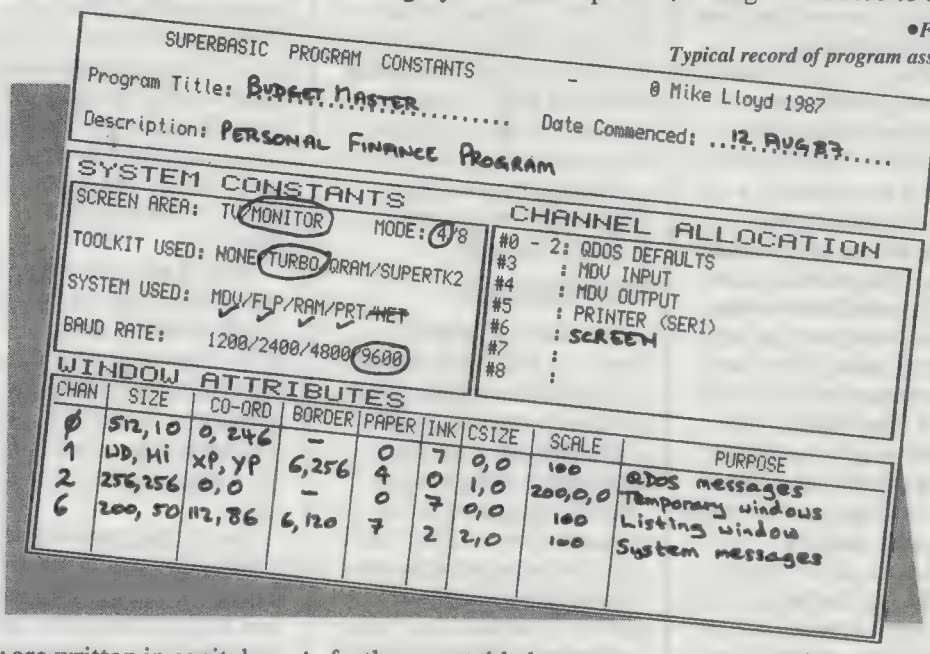
The most important thing to have correct when planning a module is its structure. Fortunately even in SuperBasic there are only a small number of control constructs and in most cases one of them will be an obvious choice for a given application. A review of past editions of *The Progs*, however, reveals that many programmers stay with the habits of less powerful dialects and thus rob their programs of the power SuperBasic control structures can provide.

Modules with no or very few control constructs can be lengthy and still be perfectly acceptable but more complex modules can lose a programmer within a dozen lines. As a rule of thumb if a module is too large to be displayed completely on-screen it should perhaps be divided into smaller modules. The April, 1987 *Better Basic* included some simple routines to help programmers navigate lengthy listings and make maximum use of the screen.

It is usually preferable to code each routine in full before conducting error-testing. Because each routine should be a "mind-sized" piece it should be possible to write the constituent commands in line number sequence without over-taxing the brain. If it becomes too difficult, however, subdivision of the module might again be necessary.

Modules should be tested prior to integrating them with other routines in the program. There are three reasons why a module might malfunction — the code might be incorrect, unexpected variable or parameter values might not be catered for, or the user might fail to act as expected and so produce an error. Programmers must accept responsibility for all program errors, however they are caused, and programs therefore need to be tested comprehensively before being distributed to an unsuspecting public.

An advantage of structuring a program properly is that routines can be tested independently. Rather than running long programs to reach the point where the module being tested is reached, user-defined pro-



•Figure two
Typical record of program assumptions

Super BASIC

PART II CONTINUED

cedures can be called by direct commands. Functions need to be tested from within dummy expressions, often simple PRINT statements such as *PRINT func (x, y, z)*.

Test harness

Where routines make assumptions about window attributes, channels and so on, or require many parameters, such rudimentary testing methods are likely to be inefficient or unworkable. The solution is to write a *test harness*, a series of commands or perhaps even a procedure in its own right, which establishes the conditions a program module expects to exist when it is called. The harness can then call the module with appropriate parameter values and display the results. Once a procedure is debugged the harness can be deleted.

Where variable values alter unexpectedly in a module the changes can be monitored by embedding *tag lines* in the routine to display variable values, using either a suitable window or the printer. The tag line might appear in more than one place so it is often more convenient to write a tag procedure.

It is important to test modules with all possible values which might occur and two useful methods to ensure that a test is exhaustive without being unmanageable are *Boundary testing* and *equivalence testing*.

Boundary tests involve identifying the highest and lowest values which a variable might take and using those values in a test harness. If they do not produce errors it is likely that all the intervening values will also work correctly.

Integer class

Equivalence testing works in a similar manner. The possible range of a variable is divided into groups of essentially equivalent values. If an integer variable is tested to see if its value lies between 1 and 10 inclusive, the class of "all integers" can be divided into three groups — those below one, those between one and 10 and those above 10. The routine should then be tested with a value from each of the three groups. If it copes correctly with those representative values it should cope with any values from each group.

Reducing bugs

One way of minimising bugs is to write general-purpose modules rather than routines which work only within the program for which they were written. The advantages of such routines are that they tend to be very readable because they include few if any global variables, they compel the programmer to cater for a wide range of possible errors, the minimum of assumptions are made and the routine can be used in other programs without modification.

Debugging takes place only once and the same problems do not need to be solved again and again. The demerits are that they tend to be longer than bespoke routines, they involve more parameter-passing, and they might not meet the requirements of a particular program precisely.

When modules are linked the program as a whole needs to be tested to eliminate unforeseen clashes which could result in run-time errors. Although it is sometimes possible to work methodically through all possible menu options and variations of procedure and function calls to search for errors, one of the best ways of finding mistakes is to let someone unconnected with the writing of the program use it unsupervised.

No absence

Sadly there is a great deal of experience that error-testing is never perfect. Testing proves only that some errors might exist — it cannot prove that no errors exist. Respected computer experts have reached the same conclusion: "Program testing can be used to show the presence of bugs but never to show their absence".

Even if programs never produce coding errors there is still plenty of scope for errors in results. The best to hope for is that a program has internal accuracy — that it is consistent even if it does not represent an external truth.

Once a program works reliably and meets the user's requirements the programmer might believe the job is complete but an important task remains. All except the most trivial programs should be documented properly to assist future amendment, to explain how the program works to another programmer and to instruct the user.

Documentation is usually divided between a users' manual and a programmers' guide. The paucity of well-written computer manuals and the many examples of poor user guides demonstrate how little attention programmers pay to informing users about how their programs should be used. Programmers' guides are rarely published but the indications are that the same low standards prevail.

A listing is a programmers' guide and it can be made very informative by the intelligent use of structure, variable names and REMarks. The nature of Basic dialects restricts the understanding which can be gleaned from a listing alone, so a programmer may wish to represent either a whole program or key parts of it in other more accessible forms. That can be done using pseudo-code, structure diagrams or flowcharts.

Structure diagrams

In practice, pseudo-code offers few advantages over a program listing for documentation purposes. Structured diagrams are excellent for representing program design down to individual user-definitions but the conventions become less apt within a module. The internal design of a module is perhaps best represented using good, old-fashioned flowcharts which have been amended suitably to represent all the SuperBasic control constructs.

Work is, apparently, going on into a utility which codes SuperBasic programs from on-screen flowcharts. While not wishing to dampen any ardour, flowcharts have litle to commend them as a planning aid but they form an excellent basis for documenting routines and can also help to disclose errors of program logic.

Super BASIC

The programmer's final job is to write a users' guide. Even programs designed to be used intuitively, as the Psion programs were meant to be, require some basic level of instruction. Good user documentation must provide clear explanations without patronising the reader. Users expect program guides to be accurate, arranged logically and written clearly in concise, jargon-free English. If those attributes can be achieved with some style and wit the guide should be a success even if the program is not.

Error-testing, pre-production trials, documentation and feedback from users can all lead a programmer to re-examine parts of the program with a fresh eye and perhaps to conclude that it could be better-written.

The keys to successful program modification are in writing the program correctly in the first place, producing adequate documentation and to some extent predicting future expansion. Menu listings and displays can be written to allow extra choices to be added to the original list and programs might be designed from scratch to cope with additional memory even if the programmer is writing on an unexpanded QL.

Start again

When the modifications for a program become too numerous or too complex, or the program outgrows some of the original design parameters, it is time to start the design process again to take advantage of the lessons. A program is only a temporary solution to a problem. The problem might change with time, the programmer's understanding of the problem might develop, an improved understanding of SuperBasic or additional computer hardware might allow a different approach to be taken, and so on.

Thus a typical program life cycle comprises evaluation of an idea, design of the higher-level structures, construction of the individual modules, comprehensive testing, documentation, modification and, eventually, supercession. It is interesting that when a program is copyrighted it appears that it is the evaluation of the idea and the structure design which primarily is protected, yet by ignoring sound planning principles many programmers spend far too little time on those essential elements.

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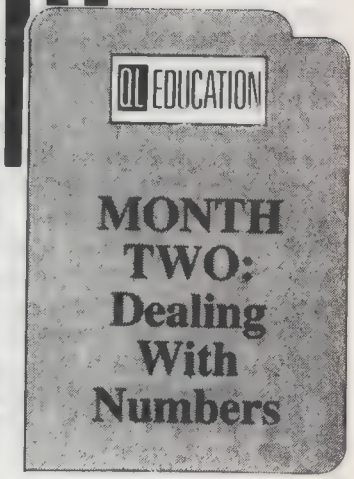


Leslie Fahidy tackles more problems faced by writers of educational software.

We looked at some topic areas in mathematics last month which are suitable for computer teaching and we finished discussing the level of difficulty one. We then started on the next level, up to age 14, modern mathematics in that area. Also, as a reminder, we are dealing with those topics, at each level, which are necessary to achieve the required degree of numeracy. We exclude those areas which are the reserve of the would-be mathematician, or necessary only for those students who intend to study at a higher level in a subject which requires a good understanding of mathematics. I am not suggesting that those areas are unimportant — simply that we do not have the time to cover the whole mathematics syllabus. In any case, students in this category are less likely to rely on a computer program to teach them mathematics.

New concepts

We have already dealt with modern mathametics in the up to 14 age group but there are other topic areas to consider. Formulae and equations is probably the first great obstacle which most students whose favourite subject is not mathematics will meet. Most types of numerical calculations are accepted to some extent but when it is a matter of calculating with letters, it does not make sense. At least, I am thinking of those for whom it does not.

While formulae and equations may represent an obstacle for some they also represent the greatest possibilities for those who write educational programs. Remember that it is a new concept which is causing the difficulty, so the computer is eminently suitable for easing the task of understanding those new concepts.

Let me give a word of warning before we start a more detailed discussion. In many areas of knowledge, there is no need for the writer of an educational program to have expertise in the field — we can always borrow the expertise from someone who knows modern languages or geography or many other subjects.

Expertise

I would not advise you to rely on outside expertise when writing educational programs in those areas of mathematics in which the acquisition of a new concept is causing the difficulty. Writing the program is simple. The difficulty is in pin-pointing those aspects of a new concept which precipitate the problem, and their recognition, plus how to deal with them, calls for expertise in mathematics.

One the greatest problems which formulae and equations cause to non-mathematicians is the idea that we may use letters in our calculations. The second biggest problem is the technique of handling quotations. The computer is eminently suitable for teaching both the idea and the technique but we should engage in some thinking before we even start working on an algorithm. Let us start with how we can explain to the learner that it makes good sense to calculate with letters.

Numbers represent a high level of abstraction. There may be three dogs or three cats, or three of virtually anything in Mother Nature, but there is no such thing as 'three'. In our program we must point out the fact, though we do not have to use words as complicated as abstraction; we must make every effort to demonstrate that we are on the students side, that we have at some stage faced the same problem. I think this point is of particular importance, since there seems to be a misconception, according to which you are either mathematically-minded or you are not.

There is no doubt that some people of all ages find mathematics easier than others. It is also true, however, that every child in normal education should be able to acquire a degree of knowledge in mathematics which is necessary in everyday life.

Abstraction

Having established the fact that pure numbers do not exist in nature, the next task is to show to the student that using letters in calculations is merely an extension of the abstraction. Try to make the student see it this way. If I can write:

Area of a rectangle = Its length multiplied by width, why could I not write:

$A = L \times W$?

So long as it is understood that letters in calculations have any meaning only if they stand for a number. We may or may not know the number for which a given letter stands but it must represent a number.

Do not try to introduce complicated examples they can follow later. The important point at this stage is to

convince the learner that what we are doing makes sense, or at least fits into the pattern of similar things we have done in the past.

I have mentioned a second difficulty at this stage, that of acquiring the technique necessary to handle equations. It is just as important as the abstract concept of using letters in calculations but I think that educationally it presents an easier task, although from a point of view of examination success it may be more important.

Recently I had a program published in Microdrive Exchange aimed at teaching the student how to solve equations. Looking through that progam may give an idea of what I have in mind but I suggest that you should either extend that program or write a separate one to include some graphics to facilitate the learning of the technique.

Scale equations

A well-tried and, as yet, unbeaten method for teaching how to manipulate equations in the one which compares an equation to a pair of scales. You could produce some interesting pictures on the screen to show you may do anything you like to one side of an equation, so long as you repeat your actions on the other side. This method could be applied as a simulation; when you add a quantity to one side, or remove it, make the pair of scales tilt in the appropriate sense and by the correct angular displacement until the same action is taken on the opposite side.

Even though it may not appear to fit into our scheme, since it is arguable that a knowledge of statistics is not necessary in everyday life, I would like to include this discipline among those which are necessary in mathematics. Statistics is needed in all the physical, social and life sciences; it also forms an integral part of most areas of business studies. Apart from that, during much of our lives we are bombarded with statistical reports of all kinds. Would it not be of benefit if the learner could understand the hidden implications behind the statement: "Eight out of 10 cat owners who stated a preference said that they preferred brand Y"?

Statistics consists, essentially, of two parts, descriptive and inferential statistics. Our main concern is with descriptive statistics since, generally, we do not start drawing conclusions making inferences until a higher level of learning is reached. In descriptive statistics at this age level and also up to and including 'O' level, the student is expected to be able to collate and tabulate data, to represent it in various graphical forms and to carry-out calculations to find the various measures of central tendency and dispersion.

Even though some new words are introduced, much of elementary discriptive statistics is more a question of technique rather than new concepts. In our teaching programs we must bear this in mind. While it is necessary to explain every new word in the terminology when it is first introduced, the emphasis should be on how to do it, i.e., on examples. Staying with terminology for a moment I find that most confusion in students' minds arises from a lack of knowledge of the precise meaning of many frequently-used words, such as set, population, distribution, sample, expectation.

Do not be misled by the fact that those words have a legitimate meaning in everyday English. Those meanings may not be the same as their specific meaning in statistics, so it is necessary to give a concise explanation of each new term. I would go so far as to suggest that when writing a statistical teaching program the author should include a help facility, enabling the student to call on screen the definition of any special word at any stage of running the program.

So far as the exercises are concerned I would suggest that, when starting a new technique, the program should work through one complete example on the screen, pausing between stages and explaining what is happening at each stage. During the course of this example, the student should be able to return to any previous stage and continue from there. The student should be encouraged to do so – reinforcement is one of the key phases in the learning process.

For the sake of an example, if the project was to draw a pie chart of the data I would go through the following stages:

Explain the technique of drawing a pie chart. Wait for confirmation that the student is ready to proceed, then clear the screen.

Present the raw data on, say, the left-hand half of the screen.

Show the same data, ranked or reorganinsed according to a stated

scheme, on the righthand side of the screen.

Ask the student to note the data, and when indicating by pressing a key that the information has been noted, clear the screen and, taking one data item after the other, work out the central angles in the pie chart.

After clearing the screen, present the ranked data angle, showing the values of the central angles in a different colour. Ask the student to carry-out each of the calculations and confirm the values calculated by the program. A practical hint is to round the angles to whole degrees — it is not reasonable to measure to an accuracy in excess of that figure.

When all necessary confirmations have been received, clear the screen and draw the pie chart. Next, give the student the choice of repeating the examples with a different set of data.

Should the student opt for no more examples, the program could generate some further raw data and present them as exercises, expecting the student to work through each in a like manner.

Another aspect of statistics for which the computer is eminently suitable is probability. There is one aspect of probability in which the concept needs careful explanation – that probabilities may be expressed on a numerical scale from zero to one. This statement is not so self-evident as it may appear to someone well-versed in probability I would certainly not try to save bytes by curtailing this explanation. The major key to success in this area is simplicity — you should certainly not try to introduce complex problems involving dependent events.

Most low-level textbooks on probability start with throwing dice and/or tossing coins and they adhere to that type of example for a long time on the learning curve. I think that this should teach us something. These methods and these simple examples have been tested and they work well so there is no need for us to deviate from accepted practices.

At level three, from the age of 14 to approximately '0' level, I realise that the requirements are different from the level we have been discussing. There are two topic areas in the range which lend themselves so well to computer teaching so it would be a great pity to by-pass them without at least a brief mention of these fields. I am thinking of elementary trigonometry and calculus.

Trigonometry may appear to be boring to the uninitiated but it is a highly-practical and exciting subject. What is more, it lends itself extremely well to computer methods of teaching.

Examine the possibilities of teaching one of the simplest and easiest statements in trigonometry: Pythagoras Theorem. 'O' level students are required to know it and use it, though they are not required to be able to prove it. Would it not convince the learner of its validity, and help it to be remembered if we were to draw a number of right-angled triangles on the screen, displaying the length of each side and the squares of the sides and asking the user to find any relationship between the sides or their squares?

It may often be true that there is no point in re-inventing the wheel but in this instance it would certainly help if we led the learner to the proper conclusion rather than state that Pythagoras has already found the answer.

That is only one possibility in teaching trigonometry but there are others. I taught the subject for many years to many students and I found that their greatest difficulty occured in appreciating the importance of sin, cos and tan. They can learn the definitions but cannot see why all the definitions are necessary.

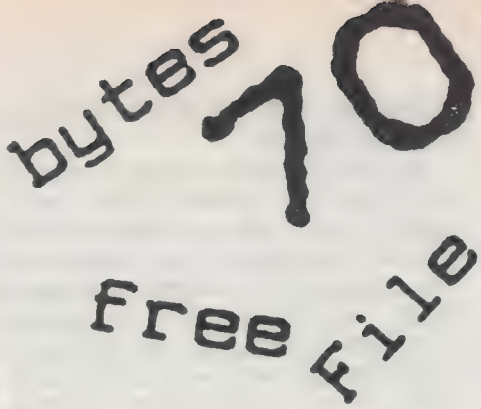
Even in the days before cheap home computers, I used to ask students to draw a family of similar right-angled triangles and measure the lengths of the sides. Further I asked them to find the ratio of two given sides by calculation. So far, the method has not failed me. Sooner or later, on each occasion, someone discovered that we could find the size of the angle by first constructing and later referring to a table of values showing the relationship between the ratio of sides and the angle. A discovery such as this, made by the student, is much more valuable than any explanation or formal proof. Need-

less to say, we can use the same method on the computer.

I feel I should mention briefly the possibilities available when teaching calculus. Drawing a curve and the tangent to the curve on the screen is the obvious way to approach the subject. If I chose to write such a program. I would start by asking some questions to ascertain that the student is able to write the equation of a straight line, given one point on the line and the angle it makes with the X-axis. If not, I would first concentrate on achieving that aim.

Once I am satisfied of the students' ability in this department, I would proceed to draw a quadratic or cubic curve, indicate a random point on the curve by a flashing dot and draw the tangent at that point. I would follow by asking the learner to write the equation of the tangent — while displaying on the screen the equation of the curve — and asking for suggestions on how we could have guessed the answer.

Whenever a possibility presents itself to lead the learner to the solution rather than make him learn it, I would always take the opportunity to do so and I am sure that, in the vast majority of cases, I would not be disappointed.



Mathematics encompasses a large number of fields. Apart from the simple cases which I have discussed. The limitation of topic areas was self-imposed; clearly, in a series of articles of this nature it is not possible to consider all possibilities but the basic principles of writing good mathematical educational software remain the same, irrespective of the area under discussion.

Make sure you understand what the problem is, or each of them if there are several, and concentrate on one point at a time. It is useless to try to teach too many principles or techniques at the same time. Because of the interdependence of one mathematical topic on the other, it usually requires careful consideration which problem must be tackled first.

Once the problem has been located it usually pays to analyse it; try to discover why the problem exists. It often happens that the lack of background knowledge is to blame; in such a case it would be pointless to continue without first supplying and reinforcing the necessary understanding.

Provide ample examples, some of which should be used as teaching material, i.e., the program works out the answers showing the method step-by-step and the rest are exercises for the student. Answers to all exercises must be checked carefully.

The program should include facilities to enable the student to return to earlier parts of the explanation. It often happens to all of us that a point appears to be clear and well-understood until the need arises to use it in an example.

The writing of good educational software generally, and mathematical software in particular, is not an easy task. The writing of the code is easy; it is only a matter of being familiar with the language. The difficulty is in analysing the problem(s) which the learner faces and constructing a logical solution which will assist in mastering the topic.

ABCElectronic

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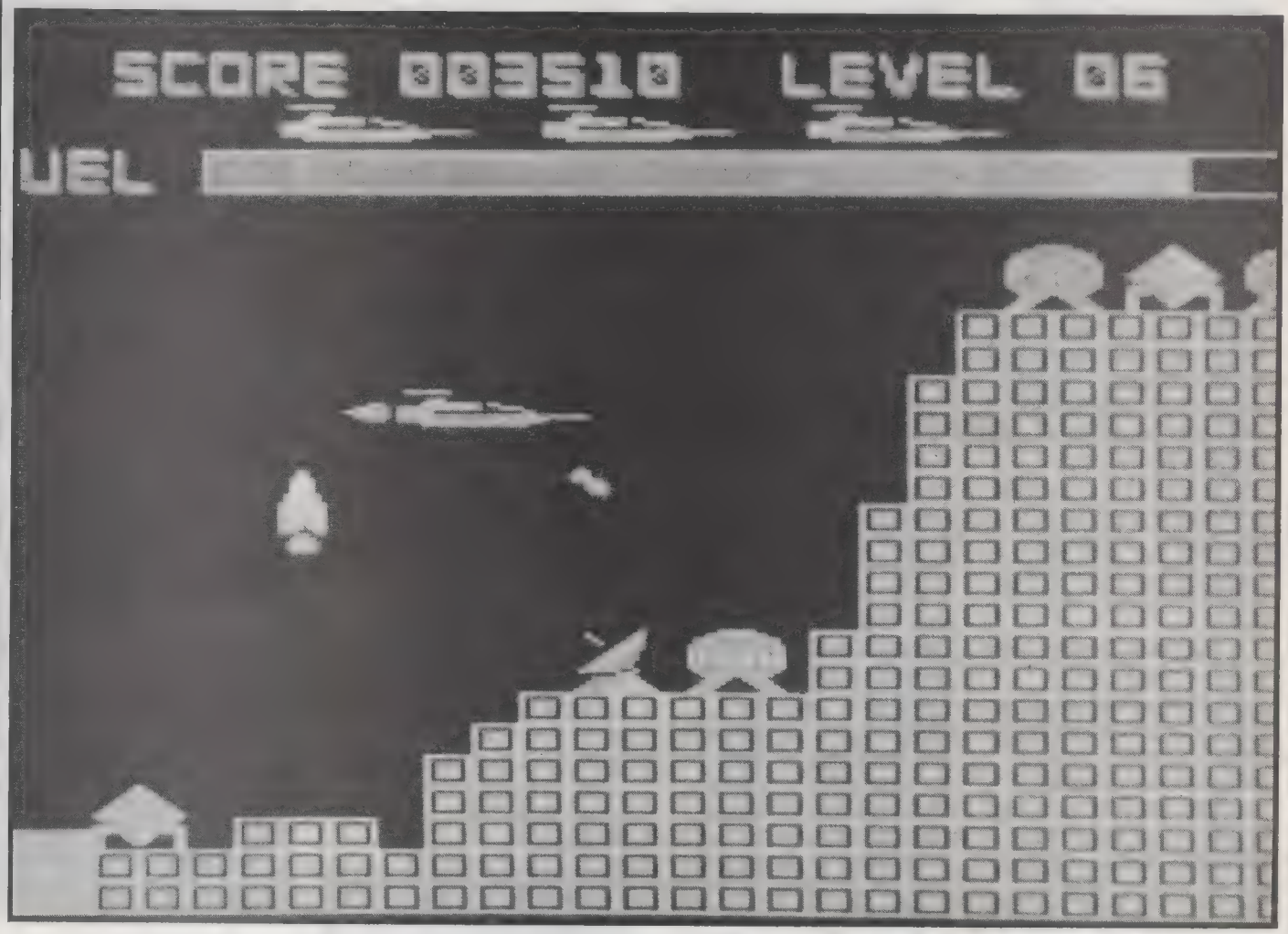
SOFTWARE FILE

Deathstrike
Talent

Stephen Applebaum reviews three new offerings from Talent, Deathstrike, Dennis the dwarf at the funfear and farmer. Each game will retail at a mere £14.95



Defender, the game in which you fly a craft across a horizontally-scrolling screen, bombing and shooting anything which baulks your passage, has provided one of the most serviceable scenarios for a computer game. There cannot be a micro on the market for which a similar game has not been written.

Now it is the turn of the QL for Talent Computer Systems has produced an excellent version called *Deathstrike*, a program which resembles another Defender pastiche called *Penetrator*, launched for the Spectrum some years ago.

Unlike the Talent platforms and ladders debacle Farmer, Deathstrike is fast and addictive, albeit just as mindless. What is most impressive about it is the way the programmers have managed to reproduce the scrolling. Considering that the QL screen can be scrolled only in 32K blocks, it is incredible how fast the sideways movement in the game is. Because the scrolling is slightly jerky, however prolonged playing of Deathstrike can cause eyestrain.

Your objective is simple; achieving it is another matter. To complete your mission and move to the next difficulty level, you must fly through seven enemy-run territories until you encounter the mothership, a vehicle which, can be destroyed only with a single, strategically-placed bomb.

Each territory is a different colour and guarded by craft exceptional to that area. All, however, have rockets which are launched the moment before you fly overhead. Rotating radar dishes pick-up your approach and must be destroyed before they warn enemy headquarters of your position.

The natural geography of the regions can also cause problems. In the early stages you fly across mountains with ravines which provide cover for enemy rockets and radar stations. Later levels pose even greater problems in the form of labyrinthine underground caverns.

All the time you are airborne your fuel is

gradually running out. Bombing ground-based fuel dumps replenishes on-board supplies, though they are often difficult to hit because of the enemy continually bombarding you with rockets.

Deathstrike is a superb version of an arcade classic and compares well to versions produced for other machines. It is to be hoped it is a taster of things to follow from Talent in the near future.

Dennis the Dwarf at the Funfear

Poor old Dennis Dwarf. First he and his drinking buddy, Enry Elf, are thrown ungraciously out of the Spotted Shrimp Inn on to Dragonspew Common and then, to ruin further what had promised to be a drinking bout of epic proportions, he is trapped among the wierd inhabitants of a funfair, where fun is the furthest thing from the proprietor's mind.

So begins *Dennis Dwarf at the Funfear*, a text adventure in two parts. In the game you play Dennis Dwarf, a rather uncouth chap whose favourite pastime, besides drinking, is picking his nose. Enry Elf is little better, though his personality is less important, since he is no more than a cipher whose purpose is to help Dennis survive a night at the fair.

Despite being imbued with an irksome infantile streak, Dennis the Dwarf at the Funfear is a good adventure with plenty to baffle and amuse adventurers of all levels of expertise.

Some puzzles in the adventure are extremely difficult. I admit that were it not for a map and a clue sheet, supplied for review purposes, I would not have been able to complete it, or at least not without suffering a migraine in the process.

The game proper begins when when Dennis Dwarf suggests he and Enry Elf stroll round the environs a seemingly deserted fairground. On passing through the front entrance they are confronted by a splash of lights and music as the fair springs instantly to life.

Many of the problems posed are set in the form of tasks. Just after passing through the entrance our two anti-heroes are confronted by a clown on stilts who offers them two tickets for a ride on the Ghost Train if they can bring back to him a manuscript belonging to Mad Morgan.

Before they can reach Mad Morgan's hideaway, Dennis Dwarf and Enry Elf must perform a number of minor tasks. On the whole they entail finding certain objects. Without a clue sheet I would have been lost, at least for a time, because many objects, such as crampons and a giant bath-plug, seem totally out of keeping with the fairground setting. I can assure you, though, that however ridiculous objects may seem, everything is relevant in this rather surreal adventure.

If you rely normally on the help facility offered by some adventures you find that Dennis the Dwarf at the Funfear is merciless in this respect. Help is given only at one specific location and then it must be requested in the context of an utterance which has to be made by Dennis Dwarf to Enry Elf.

By the time Dennis Dwarf and Enry Elf return Mad Morgan's manuscript to the clown they will have risked being eaten alive in a giant bath teeming with loofah sharks, won a goldfish and stolen something from Madam Blah Blah, the fortune teller, to name a few things. Further they will have been trapped by and escaped from accountants, replacement window salesmen and bank clerks who compromise the fair's Freak Show.

Trading the manuscript for the tickets and boarding the Ghost Train displays a code word. If you have collected 10 special items during your meanderings, the code word will allow you to enter the second part of the adventure, where you must face Satan, Griselda and Medusa, a few of the unsavoury characters who rear their ugly heads.

Should you have used one or more of the items and therefore not have the full quota, the code word will be incorrect, causing the game to be terminated but not before displaying the number of turns taken to that point and informing you that your prize is a holiday in Butlitz horrorday camp.

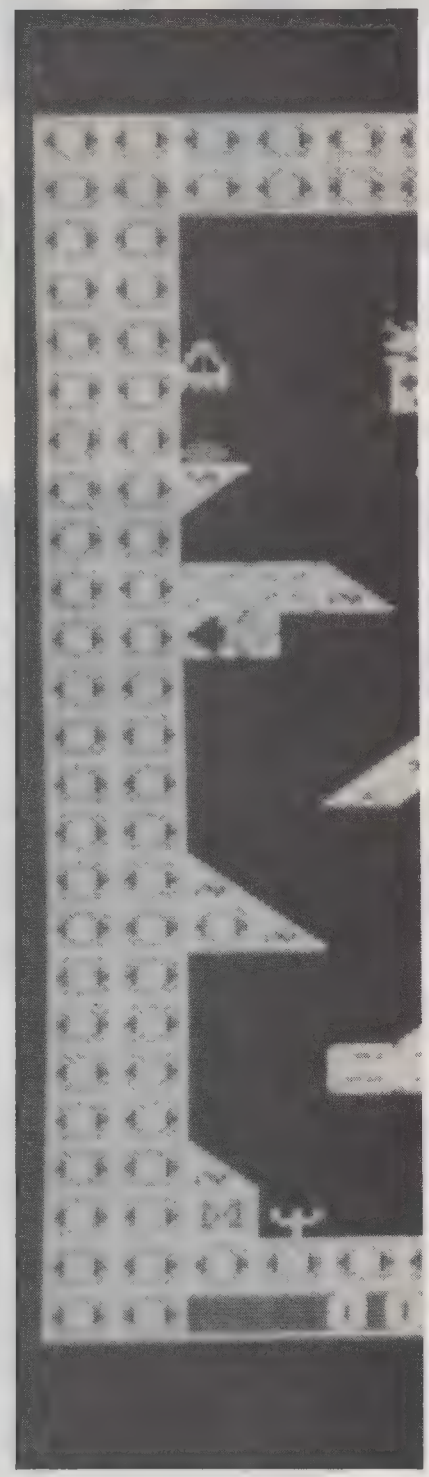
Overall, 'Dennis the Dwarf at the Funfear' is enjoyable, though it helps, if you leave your brain somewhere before playing it. That is not to say that it is easy — just that some parts of it are so childish as to be an insult to one's intelligence.

Farmer

Talent

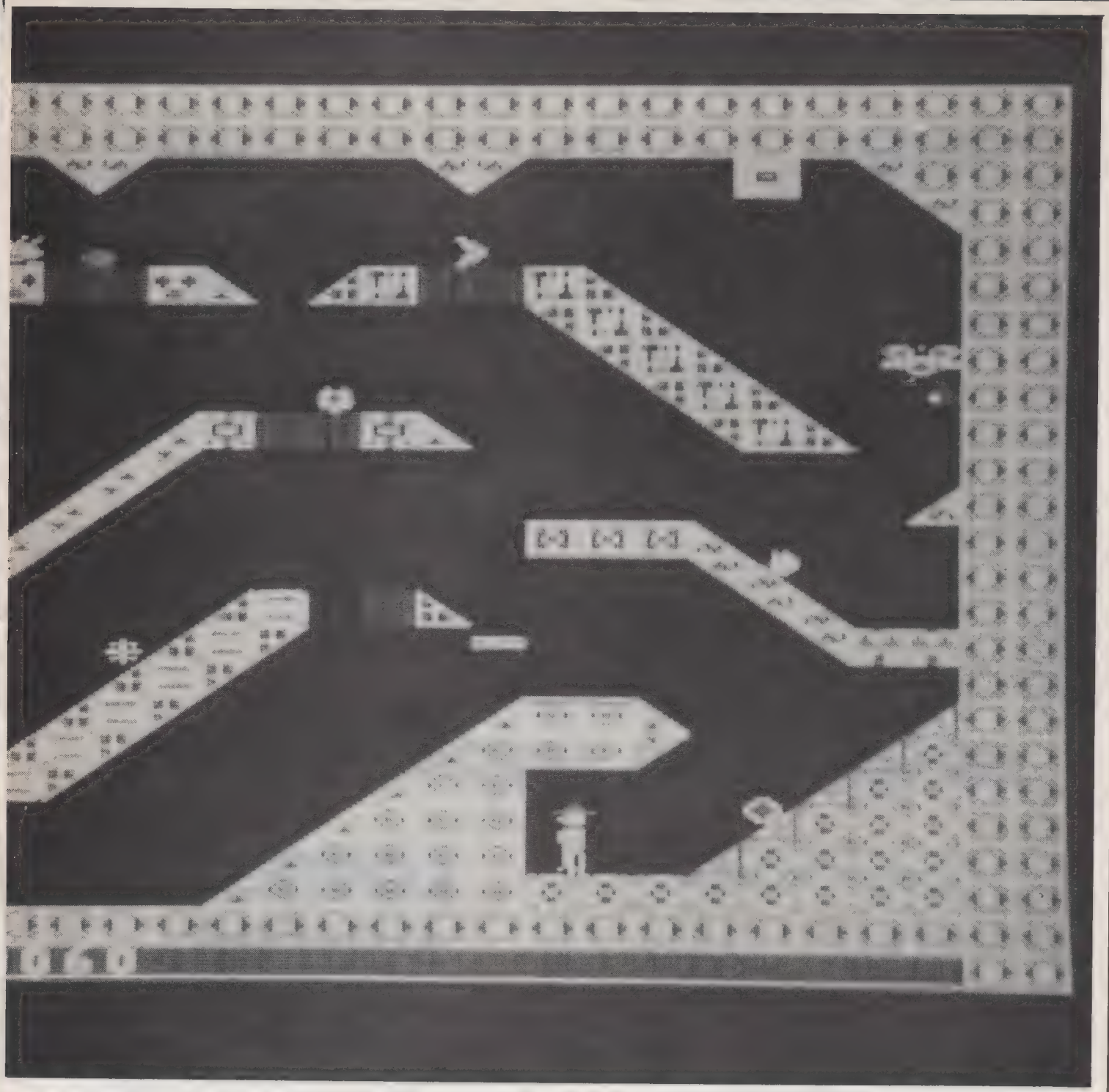
The platforms and ladders genre has been around almost as long as home computers but unlike them has been exhausted in its possibilities. Why a software house should want to continue producing them and in their most basic form, is therefore beyond me but Talent Computer Systems has done that with a leaden offering called *Farmer*.

According to the program packaging,



Above: A screen shot from the exciting 'Farmer' by Talent Computer Systems

Farmer is "an exciting new 'platform' game with excellent graphics". What it does not also tell you, however, is that you must make a back-up copy of the game before starting to play it. There is nothing



wrong with that, or at least there would not be if the copy process did not take several minutes and the program were vastly better.

Farmer is played on a farm where it is impossible to walk for more than a few steps without falling off a ledge. A pre-requisite for working there is the ability to use a parachute correctly. On the farm are grown tomatoes, bananas and pears. When the game begins, it is time to harvest the crops. Unfortunately, apart from being a hazardous architectural white elephant, the farm is also home to some very nasty monsters whose only pleasure is killing farmhands. It would be, wouldn't it?

Taking your life in your hands you must jump, hop and free-fall around the 33 similar screens, collecting all the fruit therein. Having bundled the entire harvest, you then proceed to either room 1 or room 33 from where you can reach the congratulation room.

Besides being boring Farmer is also visually dull. Its 'exciting graphics' amount to a number of coloured blocks dispersed about the screen; the odd non-descript form supposedly representing a monster; green squares identifying boggy patches; coloured rectangles denoting doors; and some almost unidentifiable fruits. The farmer is a small human figure who clicks about the screen in what must be hobnail boots, judging by the noise they make. His boots continue to make the same footstep sounds even when he is in mid-air.

There is nothing I can say to recommend Farmer. I have not seen any other platform games for the QL, so this might be the cream of the crop. If that is the case, platform and ladders fans are due for another disappointment.

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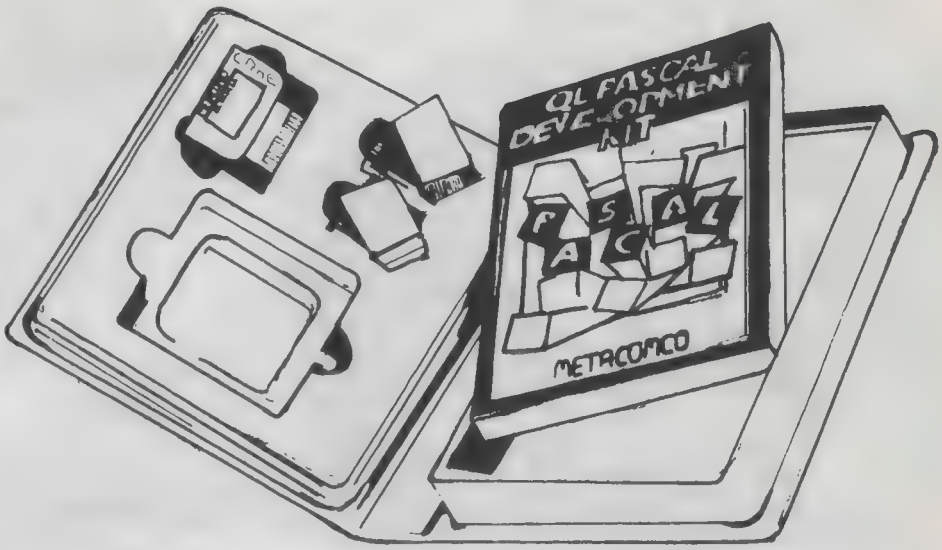

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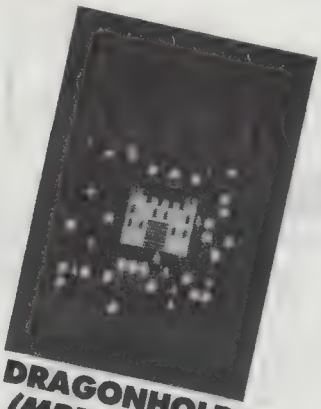

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UTILITY FILE

Ron Massey reviews another batch of useful program packages.

Product: ProCAD3
Price: £35
Source: Datanet Systems, 7 Tilgate, Luton LU2 8RR.
Tel: 0582 418492

There seems to be a disproportionate resistance towards popular acceptance of technical drawing programs. One of the reasons may be a dislike for detailed pre-planning required my many of the three-dimensional drawing systems available for home micros. If that applies to you, and drawing is your interest, the Datanet Systems new 3D drawing program, *Pro-CAD 3,* may well change your mind.

A well-planned drawing package, the Pro-CADs screen presentation is exceptional in two respects you can work alternately on two views of your drawing in its split-screen format; whether working from the left or right halves of the screen, new lines are inserted simultanerously in the companion window.

At any stage of drawing development you can switch to a third full-screen layout and view the drawing in perspective, isometric, side view or end elevation with the option of altering scale.

When the program is up and running the left-hand window contains a cross-wire cursor which can be moved in any of eight directions using cursor key combinations, for a joystick. The cursor toggles between the left and right windows by presswing the <TAB> key.

A block centred at the bottom of the screen contains information concerning the current drawing — the X, Y, Z position of the cursor calibrated in millimetres, the length of the current line, X and Z angles, and whether the BOLD highlighting option is on or off.

The menu header at the top of the screen indicates keypresses used to access the Pro-CAD range of options. <F1> calls the built-in HELP pages. All displayed help information is related to the current drawing option/mode.

Pressing <F2> accesses the complete range of file-handling commands — DIR, LOAD, SAVE, DELETE, FORMAT, set default device and escape. Moving the screen cursor produces a rubber-banded line from its previous position to the current position. Drawing commands are entered by pressing <F3>, opening a sub-menu. Options are selected from the sub-menu with a menu bar, using the up/down cursor keys, and pressing <ENTER>.

If the first option in this menu, LINE, is selected or <L> is pressed, a line is drawn from the previous cursor position to the current cursor position. If, however, you wish to locate the beginning of a new line, the MOVE option is selected.

BOLD, used for highlighting elements or planes of a drawing, may be toggled on and off. Automatic geometry has been included for producing boxes, circles and a block copy option.

Two DELETE options are available either for deleting the current line or previous lines. Escaping from this menu may be done by either selecting the ESCAPE option on the menu or by pressing <ESC>. For highly-detailed designs you can magnify either of the two input screens and effectively pan the window to any on screen location.

In addition to viewing a drawing in the two-view input mode, a range of additional projections is available. Pressing <F4> opens another sub-menu for selecting the viewing mode.

When first entering the VIEW option, the drawing is viewed in the default magnification and full-screen projection roughly analogous to isometric. That may be changed either to side or end elevations.

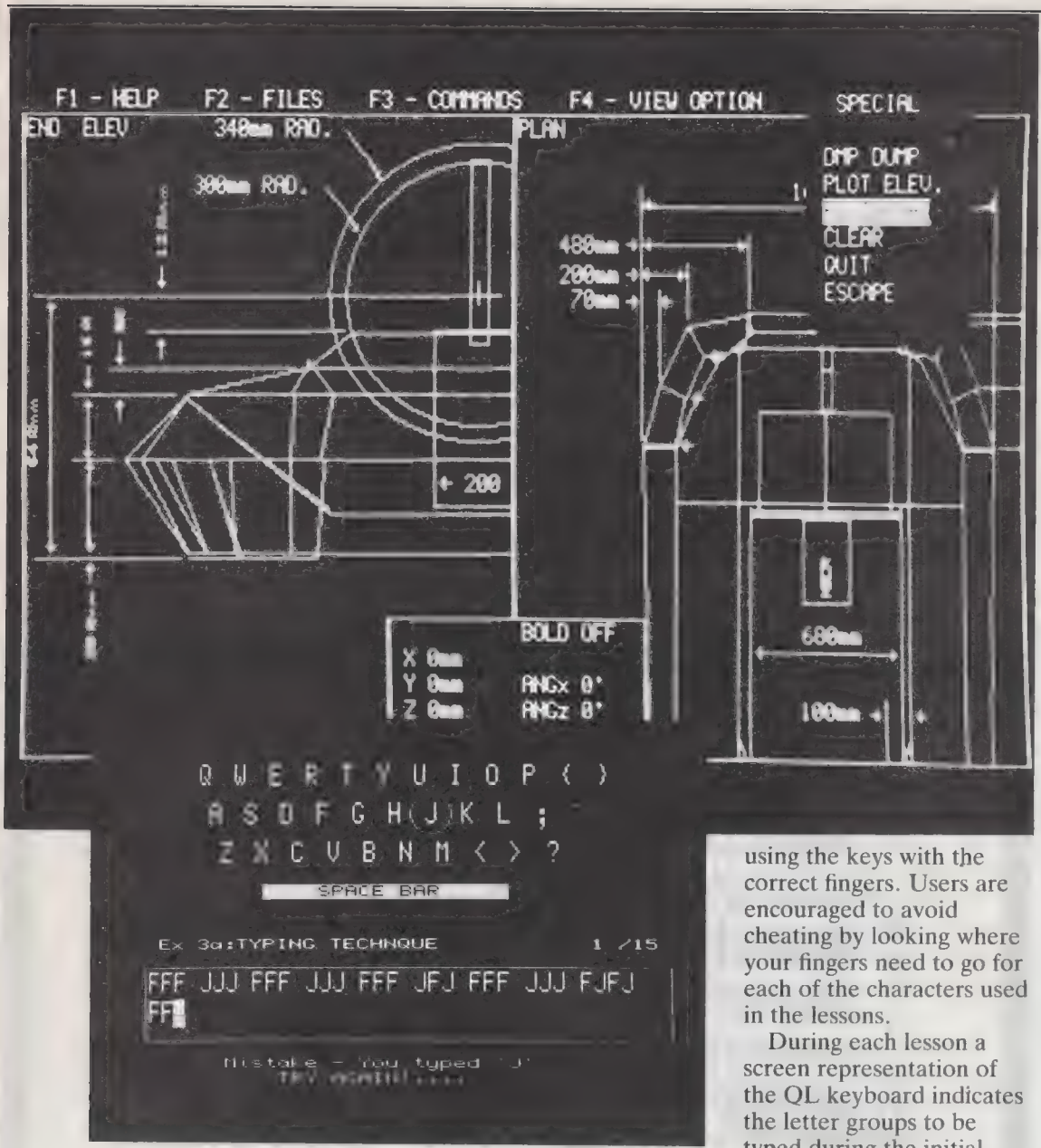
One of the VIEW features I liked especially is way the AXIS option is implemented. When first called, a drawing is shown in the default VIEW projection. Selecting AXIS from the menu, an X, Y, Z frame is overlaid on to the drawing in the centre of the screen and may be rotated, using the cursor keys.

When the frame is in the required orientation, pressing <ENTER> will re-draw the design in its new orientation, overcome one of the difficulties presented by *Concept 3D*, reviewed late last year, whereby axis orientation had to be entered manually — incidently assuming a moderate expertise in three-dimensional drawing. In this one respect, Pro-CAD works much like *Viewpoint.*

The ZOOM option, according to the documentation, allows access to 1,000 levels of magnification and reduction. Also using this option allows you to re-position the design in the screen.

LABELS can be used to dimension or annotate a design. All labelling operations, however, should be performed as the last stage of a drawing. Failing to observe this requirement may produce undesirable effects if subsequent corrections are made to drawings.

Design files produced by Pro-CAD are parameter files; co-ordinates, dimensions and such and are compact. The detailed hovercraft demonstration drawing supplied with the review program occupies slightly less than 5K of file space, the dimensioned drawing slightly more than 14K.



Output from Pro-CAD be made to a dot matrix printer, a range of plotters for which there is a plotter driver configuration routine — or the Penman plotter. Using the latter requires that drawings are plotted while in the VIEW mode. This is not a limitation of Pro-CAD but is the result of a plotting requirement of the Penman.

Overall, Pro-CAD 3 can be highly recommended; it is easy to use and includes a wide range of drawing features, enabling detailed and accurate drawings to be made. Datanet Systems has achieved a good balance of a tool which should have appeal for beginners and experienced users alike. It also works well in *Taskmaster* and, at the time of writing, was running alongside *Quill* and *The Editor.*

Product: Typing Tutor
Price: £14.95
Source: Compware, 57 Repton Drive, Haslington, Crewe CW1 1SA.
Tel: 0270 582301.

Released originally by Computer One and now available exclusively from Compware, *Typing Tutor* is one of the two complete courses available on the QL for developing or improving typing style.

Intended mainly as an introduction to learning the techniques of touch typing, the course includes 11 main lessons. Each lesson gradually introduces using the keys with the correct fingers. Users are encouraged to avoid cheating by looking where your fingers need to go for each of the characters used in the lessons.

During each lesson a screen representation of the QL keyboard indicates the letter groups to be typed during the initial part of the lesson. Incorrect letters are indicated audibly and by a circle placed around the incorrect key. Once familiarity with the set keys for the lesson is gained, the screen keyboard is blanked and you are on your own.

After completing lesson four successfully you have access to the Tutor menu which will allow you either to repeat the lesson just completed, go to the next lesson or select a particular lesson.

The structure of the lessons is intended initialy for acquiring key stroke accuracy and consistency with various letter combinations. Once an accuracy of better than 98 per cent is achieved, users are recommended to return to lesson four onwards for improvement of speed and style. A grading, given at the end of each lesson, indicates speed, in words per minute and accuracy for the lesson completed.

While not exciting graphically as the Sector Software *Touch Typist, Typing Tutor* is nonetheless a useful, albeit somewhat basic, means of improving typing capabilities and is suitable for either beginners or experienced typists.

I felt that its principal limitation is that it does not include facilities for advanced lessons, suggesting in the manual that further experience can be gained by using Quill and calculating scores manually.

Consistent with Computer One manuals, instructions are clear and to the point. Users wishing to improve typing skills will no doubt find Typing Tutor provides a definite, systematic aid toward this end.

Product: Names and Addresses
Price: £18 (standard version) £36 (RTM version)
Source: PDQL, Unit 1, Heaton House, Camden Street, Birmingham.
Tel: 021 233 3042.

A world authority on Archive, Chas Dillon has provided another useful and practical Archive RTM-based utility through PDQL. *Names and Addresses,* as the name implies, is intended for use as a dedicated personal and business database system.

The system may be configured to run from either disc or cartridge and it is recommended that users have memory expansion available; as mentioned in the manual, "no useful file sizes may be processed by this routine

UTILITY FILE

on an unexpanded QL".

N and A provides facilities for Inserting new records, Amending existing records, Deletion and record Enquiries. In addition, you can produce Short listings, Full listings, Print labels and handle general mailing.

Entirely menu-driven there are eight options, four of which are avaiable from each of the menus. Each option may be terminated by pressing the <ESC> key and control will return to the previous control level and, ultimately, to the Main menu. Pressing <ESC> in the Main menu will Quit the program.

At various points, you are offered prompts containing required responses, most of which are typically yes or no. Consistent with other Dillon programs, defaults offered require only pressing <ENTER> to speed user dialogue to accept them.

Menu option one, Insert, creates a new record. Some fields are error-trapped and will return an error message if other than the correct data or data format has been entered. Other fields are defaulted and if the Salutation, for example, is left blank or if an asterisk is entered into this field, merging this record with a document will cause a "Dear (title) (surname)" to be printed.

The Group field may be used for a variety of purposes for different types of records, allowing sorting by group type — Personal, Business, Trade or fine divisions within a record class. Applications of the latter type may include a range of suppliers of different types of components.

Control fields may be used for any purpose and provide interaction with other systems using the database, such as delivery times, expiry dates, credit limits, stock limits — virtually any application where records need to be sorted on a widely-specific basis.

Option two, Amend, requires that a record is identified from one or a combination of three fields — Record number, requiring no further identification, Surname, Address, and Company.

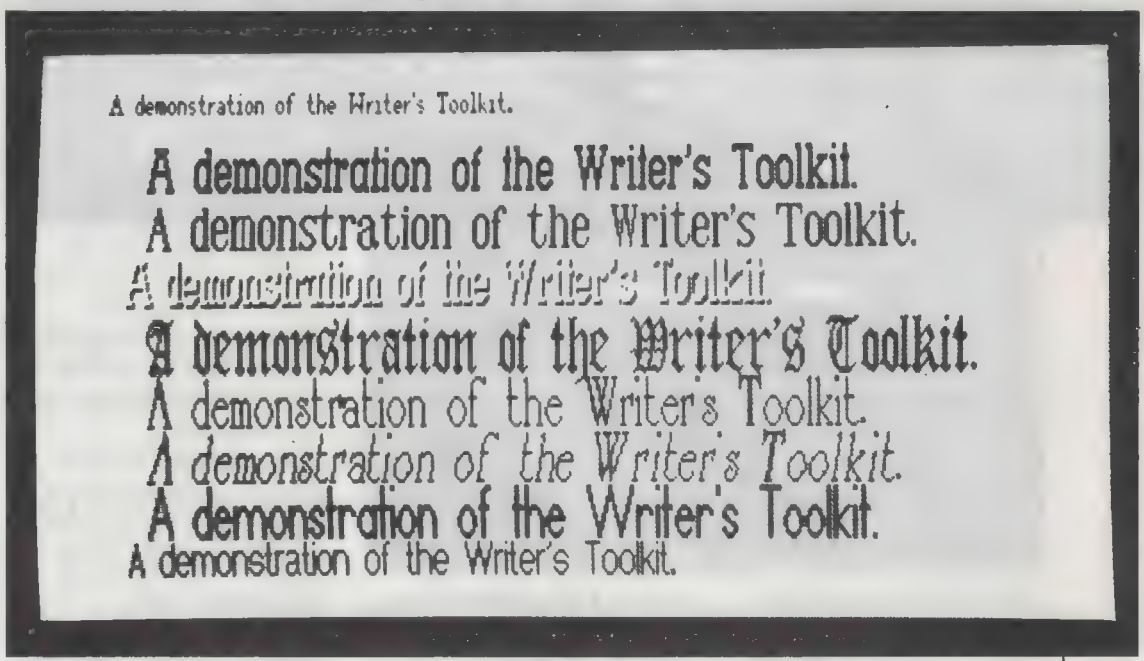
When a qualifying record is found it is presented in the same format as is used for Insertion. You then have the option of going to the next or previous record or quitting the search. A Short List of records allows selection of all or a group of files. Abbreviated details of each qualifying record are shown, each occupying one line of the report which may be viewed on-screen or printed.

General printing includes a number of very useful mid-operation options. If you need to halt the printing process for any reason, pressing any key will produce a prompt. Pressing <ENTER> accepts the default of "No".

Having halted a printout, you are offered the option of re-starting from a specified point in the records. If this option is selected, you are then asked for the Surname from which you wish to re-start.

As I have commented previously I like all Dillon programs, including the few for which I seldom have much personal use.

Having a Dillon program is a little like having a fine-tuned car in the sense that it is a joy to behold. Names and Addresses is certainly no exception.



Product: Pointer's and Writer's Toolkit
Price: £19.95
Source: TK Computerware, Stone Street, North Stanford, Ashford Kent CT25 6DF.
Tel: 0303 812801.

Many of the toolkits available are intended to be used individually as solitary sources of SuperBasic extentions for additional procedures and functions not native to the QL. Some toolkits provide specialised extensions for graphic or programming application but more commonly they provide a range of general-purpose SuperBasic commands. Two typical toolkits of the latter type are *Megatoolkit* and the QJump *Toolkit II*.

A new toolkit system, supplied as two modules which, can either be used separately or together is available from TK Computerware. *Pointer's Toolkit* and the *Writer's Toolkit* are intended to complement rather than rival *SuperToolkit II* and *QRAM* and include a range of useful commands uncommon to either of the latter two systems.

Pointer's Toolkit allows you to utilise the Sandy *Super Q Board* pointer routine or, alternatively the QRAM ptr-kbd routine and the QRAM real windowing potential. I can only assume that a future QRAM release will allow you to make use of its non-destructive windowing features, but Pointer allows you to utilise this potential now.

One of the inherent shortcomings of the QL windowing system is that if a secondary window is opened over an existing screen the area covered by the new window is lost. Several utilities are available for saving for screen area beneath a secondary window; some of these, such as Psientific *Real Windows*, are run as

independent jobs. Many of the other utilities, however, require a fairly high degree of programming proficiency to execute effectively.

Windows of defined dimensions may be opened over an area on-screen, the area beneath which is saved until the window is closed. Optionally, an opened window may be monitored so that, if a key is pressed when the arrow icon is positioned in it, the window can either be closed and the area beneath it is restored or a directive associated with it executed.

Obvious applications include real window menus which can, optionally, include icons and directive related functions. From such menus it is possible to include program commands which are pointer position-dependent.

Other Pointer commands allow you set window numbers 0, 1 and 2 to any of seven pre-defined relative sizes. A means for running a digital clock at a defined position and displaying available free memory, both of which are run as independent jobs, has also been provided.

Pointer provides for job suspension, screen blanking — after a specified time interval during which no keypresses have been detected — and a single command for killing all jobs currently running in the QL.

An additional RESPR command is provided which, like Turbo-compiled programs, will reserve a specified area of memory in the Common Heap area of memory, instead of the usual Resident Procedure Area. Using this facility means that you will never get the usual "not complete" message, if you have any currently-running jobs.

The Writer's Toolkit module allows you to use any of the 10 fonts supplied with the program on-screen. If you also happen to have *QWriter*, the 21 or so fonts included in its repertoire can be used for distinctive screen characters.

Specifying a font is simple &-FONT 4, for example, sets the current font to Old English. Characters are preceded by Writer WRITE command — analogous to PRINT — x/y pixel positioning and followeed by the characters you wish to print on-screen, using the specified font.

If, while setting-up a program, you forget which font is current, typing W-FONTS with an optional channel number will produce a list of the fonts available, with the current font preceded by a ">" flag.

You can also specify a pause between the on-screen printing of each character with the W-OPT command in units of 1/50th of a second. You can change the ink colour of Writer fonts with the W-INK command. Character size is regulated, however, by the font choice and not by the QL CSIZE command.

I liked this program system as I am a confirmed Toolkit II user and this new system has a similar feel about it. It includes a range of genuinely useful extensions which do not leave me with the feeling that some of them were included as 'fillers'.

Written by the author of *QWriter, Pointer's* and *Writer's Toolkit* is a valuable addition to anyone's toolkit armoury and will enable you to add a professional polish to your programs. Except for the fact that the screen text included in the demonstration program supplied for review was entirely in German, it provides an excellent programming model which can be adapted easily for many other applications.

The QJUMP Pointer Interface

The QJUMP Pointer Interface is the core of our development plans for the QL. This is the new standard in multi-windowing multi-tasking environments. It gives you mouse, cursor key or single keystroke control of your QL. Only QJUMP brings you a completely new environment to your expanded QL, providing non-destructive windows for any well written program (and most badly written ones too!) no menus to set up, no silly limitations, just CTRL C to switch between programs. The products that already use the Pointer Interface are just the tip of the iceberg. There is much more coming soon!

QRAM - Jetzt auf Deutsch!

QRAM is the starting point for any Pointer Interface system. The QRAM menus pop up at the touch of a key to provide Job, Channel and File maintenance as well as a an amazingly flexible screen dump. QRAM also includes a superfast RAM disk and printer buffer to add power to your QL.

QIMI is the new Internal Mouse Interface from QJUMP. A mouse interface which leaves all of the QL's expansion facilities free for other peripherals. QIMI fits right inside the QL. Tools are supplied. QIMI is compatible with the ATARI mouse.

QRAM	£29.90 (£26.00 export)	Available on Mdv / 3.5 / 5.25
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QTYP is a versatile typing checker for all users of the QJUMP Pointer Interface. Check as you type, or run your (almost!) finished document through it as a final check. Pop-up windows advise you of unknown words, suggest correct spellings given partial words, and warn you about difficult words (do they get easier with practise or practice?). You can even use it from within your own programs, for instance to analyse documents for consistent mis-spellings or range of vocabulary.

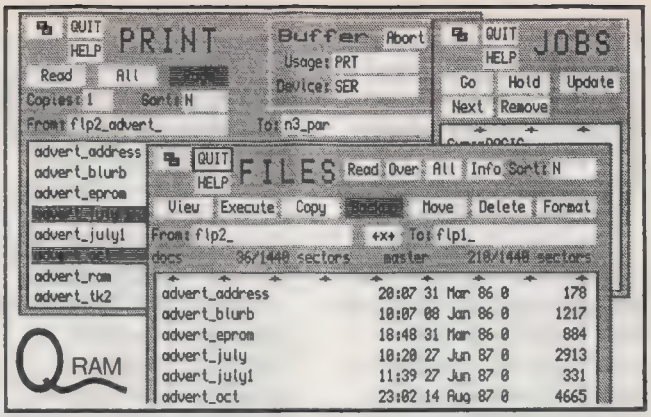
QTYP is supplied with a 40,000 word English dictionary, which you can extend or edit. Other language and specialist dictionaries can be created to your own requirements.

QTYP	£19.95 (£17.35 export)	Available on Mdv / 3.5 / 5.25

QPTR is here! At last all those who have been waiting to use the Pointer Interface in their own programs need wait no more. Instead of the 100 pages of obscure documentation that was all we had to offer before, you can now get a complete set of tools. This includes SuperBASIC and assembly language interfaces, design tools, the latest pointer interface and window manager and the obscure documentation as well! If you place no great value on your sanity, this is the package for you.

QPTR	£29.90 (£26.00 export)	Available on Mdv / 3.5 / 5.25

We are the leading producers of software for the QL market. We sell only those products which meet our own standards of performance and quality and which we have found to be essential to our business. If it is not good enough for us, then we do not believe it is good enough for you. All of our products are advertised in good faith, but it is always possible that the development of new products may be delayed.



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QEP III The "Rolls Royce" (Sinclair User) of EPROM programmers. Many QLs have been bought just to use QEP III. Programs EPROMs 2716 through to 27512. Too many facilities to describe here, it puts £1000 EPROM programmers to shame.

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DIY TOOLKIT

Each month Marcus Jeffrey adds new procedures and functions to the QL repertoire. This month he continues with a new command all the way from the U.S.A.

Continuing with our series of SuperBasic extensions, this month's new command is all the way from the U.S. It was suggested by Frank Toemay of Quantum Computing, based in New Jersey. The new command is designed to fill rectangular blocks with a certain INK colour, using a given OVER state. Does not the present BLOCK command, with the format *BLOCK [channel,] width, height, x, y, colour* already do that? It does, but the new command, which will have the format *BLOCKW [channel,] colour, over state* will fill a complete window — the specified or default channel — without having to specify co-ordinates.

At present, from SuperBasic, the only way to fill a window is either by trial and error or by knowing the exact size and position of the window, as would be the case if you had defined it yourself from within the program.

Examining the assembly code listing in figure one, the BLOCKW command is defined using the standard format. The command works first by checking to see whether a channel number has been specified. That is done by checking the second byte of the entry for the first parameter, placed automatically into the name table by Qdos when BLOCKW was called. For procedure and function parameters, the second byte of each name entry is coded in the form:

Byte = h sss tttt

where h is set if the parameter was preceded by a hash ('#') symbol. sss gives the type of the separator following the parameter: 0 = None 1 = Comma 2 = Semicolon 3 = Backslash 4 = Exclamation Mark 5 = 'TO', and tttt gives the type of the parameter: 0 = Null 1 = String 2 = Floating Point 3 = Integer

GETPARS checks to see if the first parameter is preceded by a hash and, if so, it is fetched to the arithmetic stack as an integer using the $112 vector. The pointer to the start of the name table, register A3, is updated to point to the next item, in this case the INK parameter, as would be the case if no channel parameter was given. In that way the main program can be consistent in assuming that no channel parameter was passed, having been dealt with by GETPARS. If no channel parameter was specified, the default channel one is used.

The rest of the BLOCKW code is really self-explanatory. The co-ordinates for the x, y origin of the required window channel are found from the channel definition table. The trap SD.SETMD is used to set the character writing or plotting mode to the appropriate OVER state, specified as the final parameter. Finally, the SD.FILL trap is used to fill a rectangular block, with the INK parameter being passed as an argument in register D1.B.

One of the arguments which, can be returned by the SD.FILL command is OR — -4, Out of Range — which occurs if the block to be filled falls outside the specified range of the window. That is one of the main problems when using the normal BLOCK command for filling windows. One mistake can cause an error which will halt the program. The BLOCKW command ensures that that kind of error cannot occur.

For those without an assembler, type-in the program in figure two, the SuperBasic Hex Loader. Run it and save the final code to a filename such as:

mdv1_BLOCKW_obj

If when running this program you get a checksum error, re–check your DATA. That should conform to the hexadecimal digits given down the left-hand side of the assembly code listing, with the added '00' where the assembler has updated to a word boundary in the procedure definition block.

A demonstration program is included in figure three. It opens a randomly-generated window continually — one where you could not possibly know the co-ordinates of the window — and uses the BLOCKW command to fill it. It is nothing very elaborate but

Figure 3

```
100 REPeat create_window
110   x_origin = RND(100 TO 300)
120   y_origin = RND(50 TO 150)
130   x_width  = RND(100 TO 200)
140   y_height = RND(50 TO 100)
150   WINDOW x_width,y_height,x
      _origin,y_origin
160   PAPER RND(0 TO 6)
170   INK 7 : CLS
180   INPUT"Enter fill colour: ";
      colour
190   INPUT"Enter over state:";
      over_state
200   BLOCKW colour,over_state
210 END REPeat create_window
```

DIY TOOLKIT

it proves that the command works correctly and is ready for use in your programs.

To use the demonstration program you will have to load the command into the resident procedure area and initialise it. To do so you first save an area of memory for the machine code. The minimum amount of space required will have been given by running the loader in figure two but it does not matter if you reserve more. If you want to play safe, type something along the lines:
a = RESPR(1000)

Next, you must load the machine code into this area with:
LBYTES mdv1_BLOCKW_obj, a
assuming you saved it with this name. Finally, you must initialise the extension by calling the machine code, with:
CALL a

You are then ready to

Figure 1

```
PAGE 1  QL MACRO ASSEMBLER VERSION 1.10

 LOC       OBJECT          STMT          SOURCE STATEMENT

                            1 *
                            2 *  First add the new procedure
                            3 *
0000'  3078 0110            4          MOVE.W   $110,A0        $110 = BP.INIT = Add proc/func
0004'  43FA 0006            5          LEA.L    PROC,A1        Link in procedure/function
0008'  4E90                 6          JSR      (A0)
000A'  4E75                 7          RTS
000C'  0001                 8 PROC     DC.W     1              Number of procedures
000E'  0010                 9          DC.W     BLOCKW-*       Relative location of BLOCKW
0010'  06                  10          DC.B     6              Length of procedure name
0011'  424C 4F43 4B57      11          DC.B     'BLOCKW'       Name of procedure
0018'  0000                12          DC.W     0              End of procedures
001A'  0000                13          DC.W     0              Number of functions
001C'  0000                14          DC.W     0              End of functions
                           15 *
                           16 *  BLOCKW Window Filling Routine
                           17 *
001E'  6100 004A           18 BLOCKW  BSR      GETCHAN        Get the window output channel
0022'  6600 0044           19         BNE      BWEXIT         Branch on error
0026'  3078 0112           20         MOVE.W   $112,A0        $112 = CA.GTINT = Get integers
002A'  4E90                21         JSR      (A0)
002C'  6600 003A           22         BNE      BWEXIT         Branch on error
0030'  70F1                23         MOVEQ    #-15,D0        D0 = Bad parameter error
0032'  0C43 0002           24         CMPI.W   #2,D3          Should be two parameters
0036'  6600 0030           25         BNE      BWEXIT
003A'  3836 9800           26         MOVE.W   0(A6,A1.L),D4  D4 = Ink colour
003E'  3236 9802           27         MOVE.W   2(A6,A1.L),D1  D1 = Over state
0042'  2076 C800           28         MOVE.L   0(A6,A4.L),A0  A0 = Channel ID
0046'  76FF                29         MOVEQ    #-1,D3         D3 = Infinite Timeout
0048'  702C                30         MOVEQ    #$2C,D0        D0 = SD.SETMD = Set plotting mode
004A'  4E43                31         TRAP     #3
004C'  43FA 0058           32         LEA.L    WINDOW,A1      A1 = Window Block
0050'  700A                33         MOVEQ    #$A,D0         D0 = SD.PIXENQ = Pixel window enquiry
0052'  4E43                34         TRAP     #3
0054'  43FA 0050           35         LEA.L    WINDOW,A1      A1 = Window Block
0058'  237C 0000 0000 0004 36         MOVE.L   #0,4(A1)       Set top-left corner of fill block
0060'  1204                37         MOVE.B   D4,D1          D1 = Ink colour
0062'  702E                38         MOVEQ    #$2E,D0        D0 = SD.FILL = Fill block
0064'  4E43                39         TRAP     #3
0066'  4280                40         CLR.L    D0
0068'  4E75                41 BWEXIT  RTS
                           42 *
                           43 *  This routine will get the channel parameter, or default to
                           44 *  channel #1. It will exit with (A6,A4.L) pointing to the start
                           45 *  of the appropriate channel entry in the table.
                           46 *
                           47 *  On exit, Zero Flag indicates error, held in D0.
                           48 *
006A'  1A36 B801           49 GETCHAN MOVE.B   1(A6,A3.L),D5
006E'  0205 0080           50         ANDI.B   #128,D5        Check for '#' channel
0072'  6700 0022           51         BEQ      DEFCH          Branch to default channel
0076'  48E7 0014           52         MOVEM.L  A3/A5,-(A7)
007A'  2A4B                53         MOVEA.L  A3,A5
007C'  508D                54         ADDQ.L   #8,A5          A5 = A3+8 = Just first parameter
007E'  3078 0112           55         MOVE.W   $112,A0        $112 = CA.GTINT = Get integers
0082'  4E90                56         JSR      (A0)
0084'  4CDF 2800           57         MOVEM.L  (A7)+,A3/A5
0088'  6600 001A           58         BNE      GCEXIT         Branch on error
008C'  3236 9800           59         MOVE.W   0(A6,A1.L),D1  D1 = Channel No.
0090'  508B                60         ADDQ.L   #8,A3          Move A3 to point to ink parameter
0092'  6000 0004           61         BRA      SETCHAN
0096'  7201                62 DEFCH   MOVEQ    #1,D1          D1 = Channel No.1 (Default)
0098'  7428                63 SETCHAN MOVEQ    #$28,D2        Length of channel entry
009A'  C2C2                64         MULU     D2,D1          D1 = Offset from start of table
009C'  286E 0030           65         MOVE.L   48(A6),A4      A4 = Start of channel table
00A0'  D9C1                66         ADDA.L   D1,A4          A4 = Start of channel entry
00A2'  4280                67         CLR.L    D0             Signal no error
00A4'  4E75                68 GCEXIT  RTS
                           69 *
                           70 *  Window Enquiry/Fill Block
                           71 *
00A6' =0008                72 WINDOW  DS.W     4
                           73
                           74         END
```

Figure 2

```
100 REMark : Sinclair QL World
110 REMark : ** HEX  LOADER **
120 :
130 CLS
140 RESTORE
150 READ space
160 start = RESPR(space)
170 PRINT"Loading Hex..." : hex_load start
180 INPUT"Save to file...";f$
190 SBYTES f$,start,byte
200 STOP
210 :
220 :
230 DEFine PROCedure hex_load(start)
240 :
250    DEFine FuNction decimal(x)
260    RETurn CODE(h$(x))-48-7*(h$(x)>"9")
270    END DEFine decimal
280 :
290 byte = 0 : checksum = 0
300 REPeat load_hex_digits
310    READ h$
320    IF h$="*" THEN EXIT load_hex_digits
330    IF LEN(h$)<>2*INT(LEN(h$)/2) THEN
340       PRINT"Odd number of hex digits in: ";h$
350       STOP
360    END IF
370    FOR b = 1 TO LEN(h$) STEP 2
380       hb = decimal(b) : lb = decimal(b+1)
390       IF hb<0 OR hb>15 OR lb<0 OR lb>15 THEN
400          PRINT"Illegal hex digit in: ";h$
410          STOP
420       END IF
430       POKE start+byte,16*hb+lb
440       checksum = checksum + 16*hb + lb
450       byte = byte + 1
460    END FOR b
470 END REPeat load_hex_digits
480 READ check
490 IF check <> checksum THEN
500    PRINT"Checksum incorrect. Recheck data."
510    STOP
520 ELSE
530    PRINT"Checksum is correct"
540    PRINT"Data entered at: ";start
550 END IF
560 END DEFine hex_load
570 :
580 REMark : Space requirements for the machine co
de
590 DATA 200
600 :
610 REMark : Machine code data
620 DATA "3078011043FA0006","4E904E7500010010"
630 DATA "06424C4F434B5700","0000000000006100"
640 DATA "004A660000443078","01124E906600003A"
650 DATA "70F10C4300026600","0030383698003236"
660 DATA "98022076C80076FF","702C4E4343FA005B"
670 DATA "700A4E4343FA0050","237C000000000004"
680 DATA "1204702E4E434280","4E751A36B8010205"
690 DATA "00806700002248E7","00142A4B508D3078"
700 DATA "01124E904CDF2800","6600001A32369800"
710 DATA "508B600000047201","7428C2C2286E0030"
720 DATA "D9C142804E750000","000000000000","*"
730 DATA 10687
```

type — or load, if previously typed — the program in figure three and run it. You can check easily that the command is initialised by typing a line such as:

10 blockw 1,0

using lower-case. Since the command is given in the procedure definition in uper-case, it will appear in the program listing as:

10 BLOCKW 1,0

We are still looking for new extension ideas. Before you send a letter you will notice that all the commands so far have been for use in SuperBasic. In other words they have included string PEEKs and POKEs, three-dimensional line drawing, screen saving and restoring, and so on. We intend to continue with this theme rather than include command line extensions such as TRACEing SuperBasic execution, dump printing variable and the like.

DIY TOOLKIT

Print Brother please

I cannot get my Brother HR5 to print through ser1 or ser2. I have checked the wiring on my RS232 cable and all seems to be satisfactory. I cannot even get the Psion suite to work with the printer — it just sits there and the computer locks up. I have tried the simple line BAUD 9600: OPEN#6,ser2: LIST #6: CLOSE #6. I have also tried ser1 but to no avail. The printer is satisfactory — it works with my Spectrum. Can you offer me advise how to deal with my problem?

Andrew Brown,
Wetherby,
W. Yorkshire.

A few people seem to own Brother-manufactured printers and yet are unable to link successfully them to the QL. Probably the most common reason is the particular arrangement of connections that the Brother printers require at their end (i.e., at the 25-pin D-type socket end of the cable).

When cable suppliers ship their wares they usually wire up nothing more than the data handshake and earth (common) links. In most cases that is adequate, but not in the case of most makes of Brother printer. Figure one show the connections that should be made between the QL and a Brother printer. The configuration shown has been known to work for HR5, HR10 and HR15 models. I have no reason to suppose that the cable design will fail to work with other models.

The most important point is the linking of the four pins — 4,5,6,8 — at the Brother end of the cable. Be careful how you do this because you have to bypass pin 7 (ground).

Colin Opie finds the answers to your technical problems

TECHNICAL

Upgrade query

After reading the article Economy Drive by David Hawthorne in the May issue of *QL World* I decided to try to upgrade my system by adding an Olivetti disc drive. I ordered a disc drive and power supply and waited for their arrival. On receipt of the equipment I find that my limited knowledge of the equipment means I cannot set about connecting to my QL. Could you answer the following questions?

Is an interface required and, if so, can you recommend a suitable one and where to obtain it?

What interconnections are required between the disc drive PCB edge connector and the QL or interface?

There is a four-pin plug to the right of the edge connector which I assume is to connect to the power supply. Could you inform me of the connections?

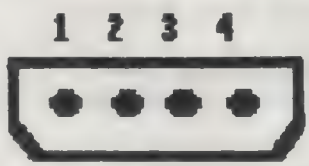
In figure two, of the article a drive selector switch is illustrated with eight twin sets of pins, could you give more information?

W. Doherty,
Barrow-in-Furness.

David Hawthorn's article in the May issue was, I think, well-written but, it seems that a number of people are still a little confused exactly what to do where and when. Let us assume for the moment that you have bought the Olivetti drives and the Viglen switched mode power supply. The answers to the specific questions posed by Doherty then become fairly straightforward.

An interface is required. Would you believe it if I said a "Disk interface" module is what is needed? The May article mentioned that such an interface was necessary, but did not quote suppliers names. In the June, 1986 issue a review of then currently available interfaces was published. Bearing in mind you are trying to perform this operation at minimum cost, your best bet is still the CST interface costing 79.95 (inc. VAT). A 3.5in or 5.25in utility disc is free with all CST disc interfaces. CST can be contacted at 24 Green Street, Stevenage, Herts SG1 3DS. Tel: 0438 352150.

The May article described a 34-way cable which had an IDC female (socket) at one end and a 34-way PCB edge connector at the other. The IDC socket will fit into the interface mentioned and the PCB edge connector fits onto the disc drive board. If you do not want to make one yourself, you should be able to buy one from any computer/electronics hardware store. Ask about prices, as they do vary.



Power connections (disk drive plug):

1. **+ 12 volts**
2. **0 volts (gnd)**
3. **0 volts (gnd)**
4. **+ 5 volts**

Figure 2. Disc drive power supply plug connections

If you buy the Viglen power supply, (as suggested), you do not need to know the power supply connections because the respective plug and socket will only mate (sensibly) in one orientation anyway. If you intend making your own supply — not recommended nowadays — you will need to buy the cable sockets from an electronics shop and wire it as shown in figure two.

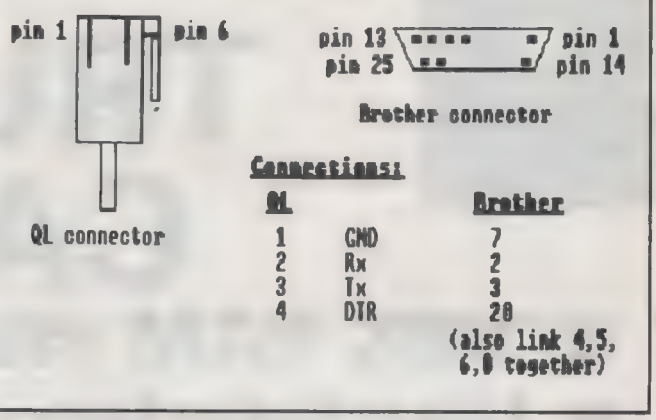
The first really useful bit of information about figure two in the May issue is that there is a labelling error regarding the eight twin sets of pins. From the top of the diagram down, it should read '3 2 1 0' and not '3 2 1 9'. That aside, Hawthorne explained the use of the pins. For the sake of soothing the reader's nerves I will endeavour to be a little more explicit. The first (numbered) set of four pairs of pins (3 2 1 0)

Three short lengths of flexible sleeved wire should do the trick.

You do not need the connections from pins 5 and 6 on the QL end of the cable, so it is worth cutting the appropriate wires back at the Brother end to ensure that no contact can be made with the 25-way D-type pins.

Brother printers are usually set to work with the device 'SER1C' and at whatever baud rate is the maximum for that printer. Quill driver options include Brother printers, so a suitable driver should be simple enough to find.

Figure 1. Connections for Brother printers



HELPLINE

enable you to set the drive number for that particular disc drive unit. On a single disc drive set up you would therefore put the jumper across the two pins marked '0'. That means your drive will be accessed from the disc interface using the device name **'flp1_'**.

With a twin drive system you would link the '0' pins on one unit, and the '1' pins on the other unit. The former drive is then accessed by **'flp1_'** and the latter by **'flp2_'**. Following this argument you can of course set a disc unit to be unit '2' (**'flp3_'**) or unit '3' (**'flp4_'**). The second set of three pairs of lettered pins is concerned with how the disc drive motor and read/write head should be selected by the disc interface. Leave the jumper on the pair marked 'C' unless you find that you cannot format a disc. If this proves to be the case you will need to jumper across one of the other two options until you can get the drive to work with your interface. Formatting a disc is the acid test, so be sure to check the drive operation in this way. If your drive does not work after all three options have been tried, something else is at fault.

Telephone solution

I would be grateful if you could advise me on a matter regarding SuperBasic programming which may also be of interest to other readers. I have recently written a specialised sales analysis program for a friend which, with my limited experience in programming, was a monumental task and, thanks to Superbasic, works very well.

Part of the program involves an input screen which lists about 25 items against which sales figures are entered. My problem is that since the figures are taken by telephone, should a mistake be made it is necessary to re-enter them.

I would like to be able to set up a screen whereby the cursor could be moved to different input items at will, and thereby assign the input to an array. If a mistake is made, you could move the cursor back to that product and change it without starting again, similar to the 'INSERT' facility in ARCHIVE.

Michael Klein,
Thatcham,
Berkshire.

```
100 REMark Guarded Input Routine
110 :
120 CLEAR: opt=4: REMark Number of options
130 DIM reply(opt), pos(opt,2), msg$(opt,30)
140 FOR i=1 TO opt
150   READ msg$(i),pos(i,1),pos(i,2)
160 NEXT i
170 :
180 REMark Display prompts
190 CLS
200 FOR i=1 TO opt
210   AT pos(i,2),pos(i,1):PRINT msg$(i)
215   AT pos(i,2),30:PRINT reply(i)
220 NEXT i
230 :
240 REMark Collect entries
250 p=1: finish=0
260 CURSET#1,1: AT pos(p,2),30: CLS#1,4: PRINT reply(p
270 AT pos(p,2),30: c$=INKEY$(#1,-1): c=CODE(c$)
280 SELect ON c
290   =10: CLS#1,4:  INPUT reply(p): p=p+1
300   =27: finish=1
310   =208: p=p-1
320   =216: p=p+1
330 END SELect
340 IF p=0: p=opt
350 IF p=opt+1: p=1
360 IF finish=0: GO TO 260
370 :
380 CURSET#1,0:  STOP
390 :
400 REMark Prompt,  X pos,  Y pos
410 DATA "RRP per unit:",2,2
420 DATA "Discount price (50+):",2,6
430 DATA "Discount price (100+):",2,10
440 DATA "Discount price (1000+):",2,14
```

Figure 3. Listing of guarded input routine

The easiest way to go about this is to use three arrays, one for the inputs required, one for the position of the screen prompt and one for the prompt. Figure three is a listing of a simple version for just four inputs. The idea can easily be expanded to cope with as many inputs per screen as necessary.

First every prompt is displayed alongside its initial value. A loop is then entered which allows you to enter new values, move up and down the list, or quit the entry stage. Note that in lines 260 and 380 the procedure CURSEN is used. This is an extension to SuperBasic and was described fully in Technical Helpline in the June issue.

To enter a new value you first have to press the ENTER key. That will delete the current displayed value and allow you to enter a new value. Note that you can circle the options using the **up** and **down** cursor control keys. For example, going up from option 1 puts you down to the last option and vice versa. When you have finished making the entries, press the **ESC** key. the entry stage.

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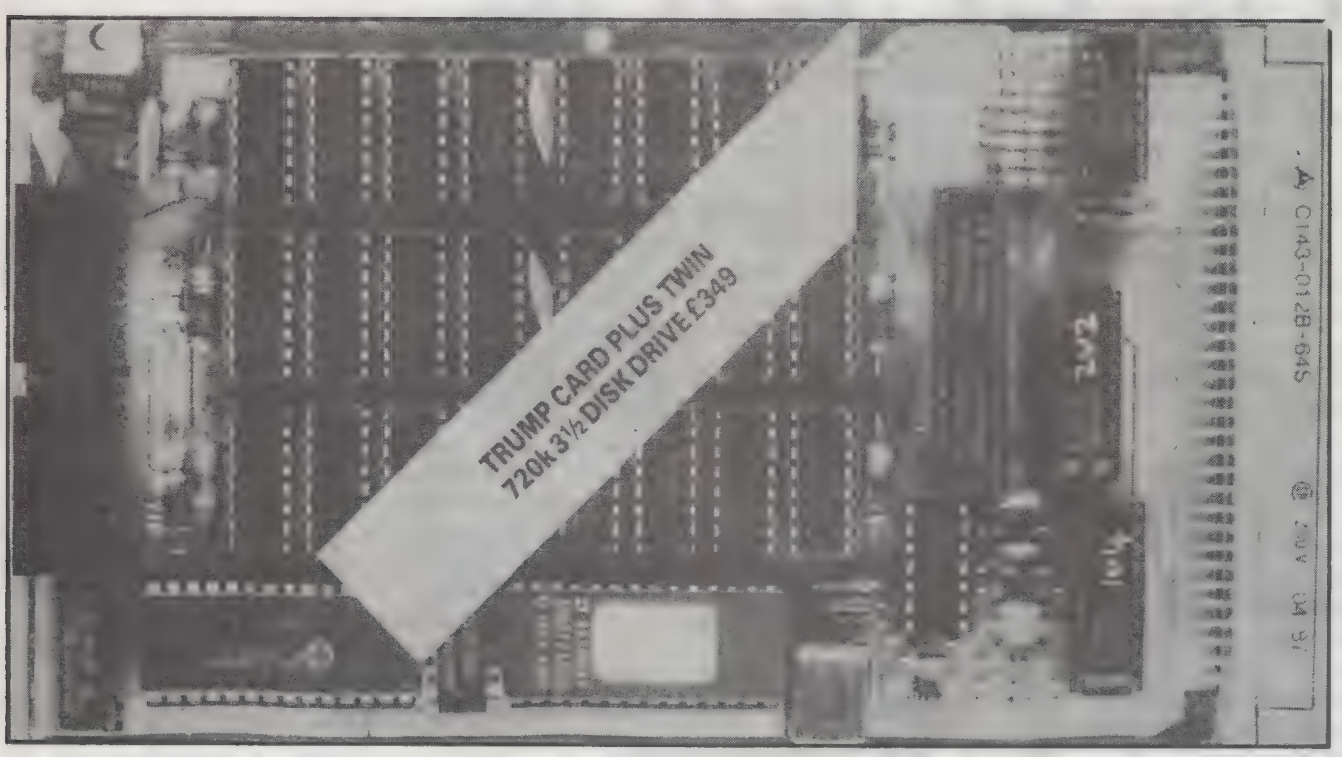

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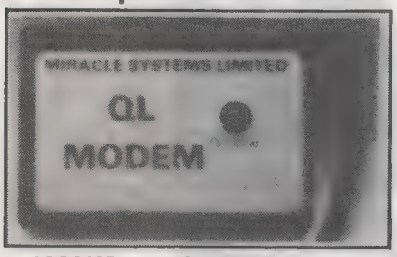

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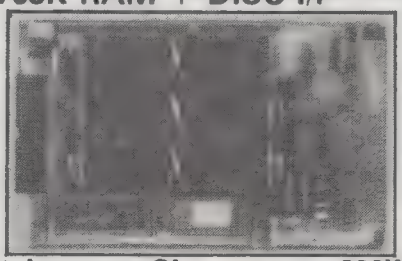

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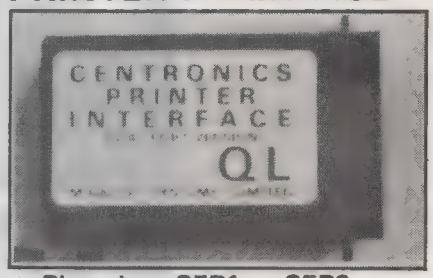

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THE PROGS

If you have a program that is worthy of consideration, send it to 'The Progs', Sinclair QL World, Greencoat House, Francis Street, London SW1P 1DG. We pay for everything published at the usual page rates — £80 per thousand words.

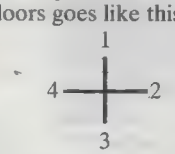
Program of the month

QSquidge — by Alan Glassbrook and Ian Swinton

Original concept by Kevin Swinton

Technical details

QSquidge has 64 locations, expandable to available free memory, made up from an 8×8 grid, which you have to collect nine items, three parts of your spaceship, three fuel pods and three microchips. Each room will have one, two or three doors. In the middle of a room there might be a character, representing a fuelpod, ship of a microchip. The numbering of the doors goes like this:



Some variable/string/PROCedure names
pieces — stores the number of objects collected.
r(xp,yp) — PROCedure to draw a room. Coordinates are stores in parameters xp, yp
prnt — Erases the re-prints Squide character.
dec — Counter for time decrement.
finish—game — Flag to check if game is finished.
wait — PROCedure to pause in gameplay.
sx, sy — Squidge coordinates.
locate (future) — Checks and, if possible, moves the location.
location$(a,b,c,) — Stores data for location in coordinates a,b; c contains maximum length of data.
logo — prints 'QSQUIDGE' vertically on the rocket.
lives — stores current lives.

Note that the graphics may not be defined properly if you have a memory expansion fitted.

Keys to use
To go left press..... 'Z'
To go right press..... 'X'
To go up press..... 'P'
To go down press..... 'L'
To collect an object press..... '—'
To halt the game press..... 'H'
To continue the game press..... 'C'

QSquidge instructions.

Squidge has crash-landed on an oversized alien planet while on his way home to his native land of Pavlonia. You must help him to gather nine parts of his damaged rocket. Because of the foul atmosphere on the planet, Squidge has only three minute to collect each item. If you fail to gather one object in a three-minute timespan you will lose one of your three lives. If you proceed you will see Squidge blast off in his rocket to Pavlonia. If you run out of lives you will be offered another attempted.

The letters in the DATA statements mean:
'L' is a left door
'r' is a right door
'u' is an upwards exit
'd' is a downwards exit
'f' is for a fuel pod
's' is for a part of Squidge's ship
'm' is for a microchip

The locations can be changed easily,
e.g.: 2820 DATA 'lrf', 'rest of locations'
2830 DATA 'more rooms'

That would tell the computer to define a location with a left and right door and a fuel pod in the middle of the screen.

```
100 REMark ****************************************
110 REMark **                  QSquidge              **
120 REMark ** By Alan Glassbrook & Ian Swinton   **
130 REMark **                July  1987            **
140 REMark ****************************************
150 :
160 :
170 MODE 8
180 REPeat forever
190   POKE 98403,2 : REMark screen_off
200   set_up_screen
210   initialise_variables
220   read_in_location_data
230   stars 438,170
240   floor
250   POKE 98403,8 : REMark switch to MODE 8
260   space
270   text
280   time
290   IF finish_game = 1 THEN
300     gameover
310   ELSE
320     lose
330   END IF
340   PAUSE
350 END REPeat forever
360 :
370 :
380 DEFine PROCedure set_up_screen
390   INK 7
400   OPEN #2,con_512x256a0x0
410   CLS #2
420   SCALE 1200,-180,-30
430   WINDOW 440,250,36,6
440   OVER -1 : CURSOR 400,10
450   PRINT '' : REMark CTRL SHIFT -
460   REMark CHR$(158)
470   OVER 0
480 END DEFine
490 :
500 :
510 DEFine PROCedure stars(maxx,maxy)
520   FOR star = 1 TO 70
530     BLOCK 2,1,RND(maxx),RND(maxy),RND(1 TO 7)
540   END FOR star
```

```
550 END DEFine
560 :
570 :
580 DEFine PROCedure floor
590   INK 1 : FILL 1
600   LINE 40,412 TO 1240,812
610   LINE 1240,812 TO 320,812
620   LINE 320,812 TO 40,412
630   LINE 40,412 TO 1240,812
640   LINE 1240,812 TO 960,412
650   FILL 0
660 END DEFine
670 :
680 :
690 DEFine PROCedure door(no)
700   INK 6 : OVER -1
710   SELect ON no
720     = 1 : INK 7 : LINE 700,812 TO 700,1000 TO
900,1000 TO 900,812
730     = 2 : LINE 1034,532 TO 1034,692 TO 1099,79
2 TO 1099,632
740     = 3 : LINE 400,412 TO 400,612 TO 600,612 T
O 600,412
750     = 4 : INK 7 : LINE 128,542 TO 128,702 TO 2
06,818 TO 206,648
760   END SELect
770   OVER 0
780 END DEFine
790 :
800 :
810 DEFine PROCedure text
820   PAPER 0 : INK 6 : CSIZE 0,1
830   AT 9,14 : PRINT 'QSQUIDGE'
840   CSIZE 0,0 : INK 3 : AT 20,14
850   PRINT '~~~~~~~~~' : INK 4
860   AT 21,9 : PRINT 'By Alan Glassbrook'
870   AT 22,9 : PRINT ' and  Ian Swinton'
880   INK 2 : AT 24,8 : PRINT 'Pieces collected :'
890   AT 24,26 : PRINT '00'
900   AT 24,28 - LEN(pieces) : PRINT pieces
910   BLOCK 400,1,20,170,3
920 END DEFine
930 :
940 :
950 DEFine PROCedure time
960   r 1,6 : INK 3
970   AT 23,8 : PRINT "TIME REMAINING :";
980   INK 7 : PRINT '3:00'
990   prnt : BEEP 20000,0,15,5,10,8,0,0
1000   REPeat control_loop
1010     keycheck : dec = dec - 32 : INK 7
1020     IF dec <= 0 THEN
1030       dec = 199 : sec = sec - 1
1040       IF sec = -1 THEN
1050         sec = 59 : min = min - 1
1060       END IF
1070       AT 23,24 : PRINT min;':';sec;'
1080     END IF
1090     IF min<= 0 AND sec<= 0 AND bitheld = 0 TH
EN
1100       show_lives : min = 3 : sec = 0
1110     ELSE
1120       IF bitheld = 1 THEN
1130         min = 3 : sec = 0 : bitheld = 0
1140       END IF
1150     END IF
1160     IF finish_game = 1 THEN
1170       EXIT control_loop
1180     END IF
1190     IF lives = 0 THEN
1200       PAUSE 100 : EXIT control_loop
1210     END IF
1220   END REPeat control_loop
1230 END DEFine
1240 :
1250 :
1260 DEFine PROCedure keycheck
1270   IF KEYROW(4) = 4  THEN wait
1280   IF KEYROW(2) = 2  THEN left
1290   IF KEYROW(7) = 8  THEN right
1300   IF KEYROW(4) = 32 THEN up
1310   IF KEYROW(4) = 1  THEN down
1320   IF KEYROW(5) = 32 THEN check
1330 END DEFine
1340 :
1350 :
1360 DEFine PROCedure left
1370   prnt
1380   sx = sx - 32
1390   IF sx< 760 - (sy - 84) AND sy > 430 AND sy
< 460 AND d(4) = 1 THEN
1400     locate 1
1410   ELSE
1420     IF sx < 769 - (sy - 84) THEN
1430       sx = sx + 32
1440     END IF
1450   END IF
1460   prnt
1470 END DEFine
1480 :
1490 :
1500 DEFine PROCedure right
1510   prnt
1520   sx = sx + 32
1530   IF sx>1720 - (sy - 84) AND sy > 430 AND sy
< 460 AND d(2) = 1 THEN
1540     locate 4
1550   ELSE
1560     IF sx > 1720 - (sy - 84) THEN
1570       sx = sx - 32
1580     END IF
1590   END IF
1600   prnt
1610 END DEFine
1620 :
1630 :
1640 DEFine PROCedure up
1650   prnt
1660   sx = sx + 16 : sy = sy - 16
1670   IF sx > 979 AND sx < 1141 AND sy < 268 AND
d(1) = 1 THEN
1680     locate 3
1690   END IF
1700   IF sy < 268 THEN
1710     sy = sy + 16 : sx = sx - 16
1720   END IF
1730   prnt
1740 END DEFine
1750 :
1760 :
1770 DEFine PROCedure down
1780   prnt
1790   sx = sx - 16 : sy = sy + 16
1800   IF sx > 675 AND sx < 805 AND sy > 588 AND d
(3) = 1 THEN
1810     locate 2
1820   END IF
1830   IF sy > 588 THEN
1840     sy = sy - 16 : sx = sx + 16
1850   END IF
1860   prnt
1870 END DEFine
1880 :
1890 :
1900 DEFine PROCedure prnt
1910   INK 7 : OVER -1
1920   CURSOR sx / 4,sy / 4
1930   PRINT '' : REMark CTRL SHIFT .
1940   REMark CHR$(158)
1950   IF NOT BEEPING THEN BEEP 1,10,15,5,100,0,12
,0
1960   OVER 0 : dec = dec - 7
1970 END DEFine
1980 :
1990 :
2000 DEFine PROCedure locate(future)
2010   SELect ON future
2020     = 1 : IF roomx > 1 THEN r roomx,roomy
                                : roomx = roomx -
 1 : r roomx,roomy
   : sx = 1348
2030     = 2 : IF roomy < 16 THEN r roomx,roomy
                                : roomy = roomy +
 1 : r roomx,roomy
   : sy = 290 : sx = 1050
2040     = 3 : IF roomy > 1 THEN r roomx,roomy
                                : roomy = roomy -
 1 : r roomx,roomy
   : sy = 580 : sx = 765
2050     = 4 : IF roomx < 16 THEN r roomx,roomy
                                : roomx = roomx +
 1 : r roomx,roomy
   : sx = 388
2060   END SELect
2070 END DEFine
2080 :
2090 :
2100 DEFine PROCedure initialise_variables
2110   DIM d(5),finit$(30),M$(20),mt$(10)
2120   DIM congrat$(20),log$(8),a$(2),message$(255
```

```
)
2130   DIM endmessage$(30),char$(10),word$(10)
2140   REMark Next line speeds up cursor
2150   POKE_W 163982,-255 : POKE_W 163980,9
2160   sx = 692 : sy = 404 : min = 3 : pieces = 0
2170   bitheld = 0 : finish_game = 0 : lives = 3
2180   roomx = 1 : roomy = 6 : sec = 0 : dec = 199
2190   shipcol = 0 : fuelcol = 0 : chipcol = 0
2200 END DEFine
2210 :
2220 :
2230 DEFine PROCedure space
2240   mes 150,200,'PRESS SPACE'
2250   REPeat get_spacebar
2260     a$ = INKEY$
2270     IF a$ = ' ' THEN EXIT get_spacebar
2280   END REPeat get_spacebar
2290   mes 150,200,'PRESS SPACE'
2300 END DEFine
2310 :
2320 :
2330 DEFine PROCedure mes(wordx,wordy,message$)
2340   INK 1 : OVER -1
2350   CURSOR wordx,wordy
2360   PRINT message$ : INK 5
2370   CURSOR wordx - 4,wordy + 2
2380   PRINT message$ : OVER 0
2390 END DEFine
2400 :
2410 :
2420 DEFine PROCedure wait
2430   mes 10,20,"TIME HELD"
2440   REPeat hold
2450     IF KEYROW(2) = 8 THEN EXIT hold
2460   END REPeat hold
2470   mes 10,20,"TIME HELD"
2480 END DEFine
2490 :
2500 :
2510 DEFine PROCedure gameover
2520   finish_game = 0
2530   finit$ = "G A M E  O V E R !"
2540   OVER #2,-1 : CSIZE #2,0,1
2550   FOR f = 1 TO LEN(finit$)
2560     INK RND(2 TO 7)
2570     CURSOR #2,50 + (f * 20),100
2580     PRINT #2;finit$(f);
2590     BEEP 1000,0 + (f)
2600     PAUSE 2
2610   END FOR f
2620   OVER #2,0 : PAUSE 200
2630   BEEP 500,0
2640   congratulations
2650 END DEFine
2660 :
2670 :
2680 DEFine PROCedure read_in_location_data
2690   RESTORE 2820
2700   DIM location$(8,8,10)
2710   FOR gridx = 1 TO 8
2720     FOR gridy = 1 TO 8
2730       READ word$
2740       location$(gridy,gridx) = word$
2750     END FOR gridy
2760   END FOR gridx
2770 END DEFine
2780 :
2790 :
2800 REMark Data for the 64 screens.
2810 :
2820 DATA 'rd','ld','dr','ld','rd','lf','r','ld'
2830 DATA 'ud','ud','ud','ud','ur','lrd','lcr','lu
d'
2840 DATA 'ud','ud','ud','ur','lr','lfu','rd','lud
'
2850 DATA 'ud','ud','ud','dsr','lr','lr','lu','ud'
2860 DATA 'ud','ur','lu','udr','lr','lr','l','ud'
2870 DATA 'ur','lc','cd','udr','l','dr','lr','lus'
2880 DATA 'rd','lr','ul','ur','lr','lsur','lr','ld
'
2890 DATA 'ur','lr','lr','lr','lr','rfl','lr','lu'
2900 :
2910 :
2920 DEFine PROCedure r(xp,yp)
2930   FOR dd = 1 TO 4
2940     d(dd) = 0
2950   END FOR dd
2960   partship = 0 : fuelpod = 0 : microchip = 0
2970   mt$ = location$(xp,yp)
2980   FOR readthru = 1 TO LEN(mt$)
2990     char$ = mt$(readthru)
3000     IF char$ = 'u' THEN door 1 : d(1) = 1
3010     IF char$ = 'r' THEN door 2 : d(2) = 1
3020     IF char$ = 'd' THEN door 3 : d(3) = 1
3030     IF char$ = 'l' THEN door 4 : d(4) = 1
3040     IF char$ = 'f' THEN fuelpod = 1 : bit 2
3050     IF char$ = 's' THEN partship = 1 : bit 1
3060     IF char$ = 'c' THEN microchip = 1 : bit 3
3070   END FOR readthru
3080 END DEFine
3090 :
3100 :
3110 DEFine PROCedure bit(object)
3120   INK 4 : OVER #2,-1
3130   CSIZE #2,3,1 : AT #2,5,16
3140   SELect ON object
3150     =1:PRINT #2,',';:REMark CTRL SHIFT L(Ship
)
3160     =2:PRINT #2,'7';:REMark CTRL SHIFT W(Fuel
)
3170     =3:PRINT #2,'=';:REMark      EQUAL  (Chip
)
3180   END SELect
3190   CSIZE #2,0,0 : OVER #2,0
3200 END DEFine
3210 :
3220 :
3230 DEFine PROCedure check
3240   pc = 0
3250   IF partship = 1 THEN wipe_ship : pc = 1
3260   IF fuelpod = 1 THEN wipe_fuel : pc = 1
3270   IF microchip = 1 THEN wipe_chip : pc = 1
3280   IF pc = 1 THEN
3290     pieces = pieces + 1 : BEEP 1000,1 : min =
 3
3300     INK 2 : AT 24,28 - LEN(pieces)
3310     PRINT pieces : bitheld = 1
3320   END IF
3330   IF shipcol=3 AND fuelcol=3 AND chipcol=3 TH
EN
3340     finish_game = 1
3350   END IF
3360 END DEFine
3370 :
3380 :
3390 DEFine PROCedure wipe_ship
3400   shipcol = shipcol + 1
3410   FOR take = 1 TO LEN(mt$)
3420     IF mt$(take) = 's' THEN mt$(take) = '0'
3430   END FOR take
3440   location$(roomx,roomy) = mt$
3450   partship = 0 : bit 1
3460 END DEFine
3470 :
3480 :
3490 DEFine PROCedure wipe_fuel
3500   fuelcol = fuelcol + 1
3510   FOR take = 1 TO LEN(mt$)
3520     IF mt$(take) = 'f' THEN mt$(take) = '0'
3530   END FOR take
3540   location$(roomx,roomy) = mt$
3550   fuelpod = 0 : bit 2
3560 END DEFine
3570 :
3580 :
3590 DEFine PROCedure wipe_chip
3600   chipcol = chipcol + 1
3610   FOR take = 1 TO LEN(mt$)
3620     IF mt$(take) = 'c' THEN mt$(take) = '0'
3630   END FOR take
3640   location$(roomx,roomy) = mt$
3650   microchip = 0 : bit 3
3660 END DEFine
3670 :
3680 :
3690 DEFine PROCedure congratulations
3700   MODE 8 : col = 0
3710   CSIZE 0,1 : RESTORE 3880
3720   FOR blob = 0 TO 8
3730     col = col + 1
3740     READ congrat$
3750     IF congrat$ = '' THEN PRINT : craft
3760     IF col = 8 THEN col = 1
3770     INK col
3780     IF blob > 5 THEN
3790       PRINT TO 10 ; congrat$
3800     ELSE
3810       PRINT congrat$
3820     END IF
3830   END FOR blob
```

```
3840    CSIZE #3,0,0 : CSIZE 0,0
3850  END DEFine
3860  :
3870  :
3880  DATA 'Well Done !!!','You have helped'
3890  DATA 'SQUIDGE to return'
3900  DATA 'to his home planet','PAVLONIA....'
3910  DATA '','Press any key','for another'
3920  DATA 'quest !!!!'
3930  :
3940  :
3950  DEFine PROCedure craft
3960    OPEN #3,scr_100x200a340x20
3970    OPEN #4,scr_330x20a30x130
3980    rocket : logo : INK #4,4
3990    PRINT #4,'__' : INK #4,6
4000    OVER #4,-1 : AT #4,0,0
4010    PRINT #4,' ' : OVER #4,0
4020    REMark '<SPACE> CTRL SHIFT .'
4030    BEEP 0,255 : INK #4,4
4040    FOR ac = 1 TO 88
4050      AT #4,0,0
4060      PRINT #4,'_'
4070      PAN #4,4
4080    END FOR ac
4090    BEEP : PAUSE 50 : BEEP 0,250
4100    FOR ac = 1 TO 86
4110      PAN #4,-4
4120    END FOR ac
4130    BEEP : PAUSE 150
4140    FOR bep = 56 TO 28 STEP -1
4150      BEEP 0,bep,bep+2,.5,.5,5,10,10
4160    END FOR bep
4170    sc = 0
4180    FOR bep2 = 28 TO 1 STEP -1
4190      sc = sc + 1
4200      BEEP 0,bep2,bep2 + 2,.5,.5,5,10,10
4210      SCROLL #3,-sc
4220    END FOR bep2
4230    PAUSE 50 : BEEP
4240    PAN 120
4250  END DEFine
4260  :
4270  :
4280  DEFine PROCedure logo
4290    log$ = 'QSQUIDGE'
4300    OVER #3,-1
4310    INK #3,6
4320    FOR 12 = 1 TO 8
4330      CURSOR #3,40,80 + 12 * 10
4340      PRINT #3,log$(12)
```

```
4350    END FOR 12
4360    OVER #3,0
4370  END DEFine
4380  :
4390  :
4400  DEFine PROCedure rocket
4410    BLOCK #3,50,90,20,90,7
4420    INK #3,7
4430    FILL #3,1
4440    LINE #3,11,10 TO 8,0 TO 17,0 TO 14,10
4450    FILL #3,0
4460    FILL #3,1
4470    LINE #3,22,10 TO 18,0 TO 27,0 TO 24,10
4480    FILL #3,0
4490    FILL #3,1
4500    LINE #3,7.5,55 TO 17,70 TO 26,55
4510    FILL #3,0
4520  END DEFine
4530  :
4540  :
4550  DEFine PROCedure lose
4560    MODE 8 : POKE 98403,2
4570    OVER -1 : stars 400,200
4580    RESTORE 4670 : CSIZE 0,1
4590    PRINT \\ : c = 0
4600    FOR prt = 1 TO 7
4610      c = c + 1 : IF c = 8 THEN c = 1
4620      INK c
4630      READ endmessage$
4640      PRINT TO(36-LEN(endmessage$))/2;endmessag
e$
4650    END FOR prt
4660    CSIZE 0,0 : POKE 98403,8 : OVER 0
4670    DATA 'Tough Luck !','You failed to repair'
4680    DATA 'your SQUIDGE craft'
4690    DATA 'and return to your home !!'
4700    DATA '','Press any key to','play again....'
4710  END DEFine
4720  :
4730  :
4740  DEFine PROCedure show_lives
4750    INK 5
4760    OVER -1
4770    lives = lives - 1
4780    CURSOR 400 + (lives * 12),10
4790    PRINT '' : REMark CTRL SHIFT .
4800    REMark CHR$(158)
4810    OVER 0
4820    FOR b = 5 TO 1 STEP -1
4830      BEEP 3000,b,b + 5,250,1,0,5,0
4840    END FOR b
4850  END DEFine
```

THE PROGS

If you have a program that is worthy of consideration, send it to 'The Progs', Sinclair QL World, Greencoat House, Francis Street, London SW1P 1DG. We pay for everything published at the usual page rates — £80 per thousand words

Compress by D. Marsh

Compress is a utility which will compress QL SuperBasic files into a much more compact form without losing the structure of the program. The principle advantage is that the storage space required for the program, either on disk or Microdrive, is reduced. That is particularly true for large SuperBasic programs.

The storage of large programs is not a problem for disk drive owners but it can be for those who depend upon Microdrives. Another benefit is that the compressed program will load slightly faster than previously due to the more compact lines. *Compress* gives you the option of how you wish to compact the program.

Listings one and two are the same procedure but listing two is the compressed version. Compress can reduce commands to their shorter form — i.e., DEFine PROCedure becomes DEFPROC; it will concatenate lines and remove the spaces between numbers and lines. The procedure does nothing in particular, hence its name, so do not bother to type it in.

If you look carefully at the listings you will notice that the program structure is not destroyed. When you load the compressed procedure the computer will restore the commands automatically to their long form, as that is the manner in which they would normally be saved, as well as insert spaces between numbers and lines. Therefore the program cannot lose its readability. That is very important to programmers.

The listings for Compress include comments for what each main part does. When using Compress you will be asked for the name of the file to be compressed. The file should be on Microdrive 1. It will store the compressed file on Microdrive 2, any file with the same name being over-written. It then asks you how you wish to compress the file.

SHORTEN ONLY will only reduce commands to their shorter form. It does not concatenate lines. COMPRESS FULL will concatenate lines and reduce command size. Finally, it asks how you wish to number the file. It can kill the file numbers if you wish — see *QL World* September, 1986, for uses of this.

Try Compress on a small program first as an example then copy the compressed program to the screen by COPY MDV1/2 — FILENAME TO SCR.

If you write your SuperBasic programs with a number of GOTOs and/or GOSUBs do not use the COMPRESS FULL option. That is because Compress does not check line number calls in GOTOs or GOSUBs and correct them for the called lines which are concatenated. Use only the SHORTEN ONLY option, since that does not alter the number of lines in the program. Also do not renumber the file.

This should not be a problem since the main advantage of SuperBasic is that the program can be written without GOTOs and GOSUBs as the user guide suggests. If you cannot survive without that GOTO the memory saving is still significant using the SHORTEN ONLY option alone.

Listing 2

```
1DEFPROC DOES_NOTHING
2A=0:B=0:C=0:D=0:E=0:F=0
3REP LOOP
4A=A+1:B=B+1:C=C+1
5IF C=100:EXIT LOOP
6END REP LOOP
7D=RND(0 TO 10)
8IF D=5:STOP
9ENDDEF
```

Listing 1

```
100 DEFine PROCedure DOES_NOTHING
110 LET A=0:LET B=0:LET C=0
120 LET D=0:LET E=0:LET F=0
130 REPeat LOOP
140 LET A=A+1:LET B=B+1:LET C=C+1
150 IF C=100 THEN EXIT LOOP
160 END REPeat LOOP
170 LET D=RND(0 TO 10)
180 IF D=5 THEN STOP
190 END DEFine DOES_NOTHING
```

```
1 REMark QL COMPRESS - DAVID MARSH 1987 - VERSION
3.00
2 :
3 REMark THIS PROGRAM WILL COMPRESS A SUPERBASIC F
ILE TO IT MINIMUM
4 REMark SIZE BUT MORE IMPORTANTLY WITHOUT LOSING
ITS STRUCTURE.
5 REMark IF YOU WISH IT CAN KILL THE NUMBERS IN A
FILE. SEE SEPT 1986 OF
6 REMark QL WORLD TO SEE THE USE OF THIS.
7 :
8 CLEAR:SETUP
9 SERVICE:WORK:COMPLETE
10 :
11 REMark SERVICE ASKS USER QUESTIONS ABOUT HOW TH
E COMPRESS IS TO BE
12 REMark PERFORMED. NOTE THAT COMPRESS CAN GENERA
TE FILES WITHOUT
13 :
14 DEFine PROCedure SERVICE
```

```
15 CLS#3:INPUT#3," COMPRESS FILE="!F$
16 IF F$="":SERVICE
17 F1$="MDV1_"&F$:F2$="MDV2_"&F$
18 CLS#3:PRINT#3," (C)OMPRESS FULL   (S)HORTEN ONL
Y"
19 REPeat CHOOSE
20 GETKEY
21 IF K=67:SEV%=1:EXIT CHOOSE
22 IF K=83:SEV%=2:EXIT CHOOSE
23 END REPeat CHOOSE
24 CLS#3:PRINT#3," (R)ENUMBER   (S)AME NUMBER   (K
)ILL"
25 REPeat NUMBER
26 GETKEY
27 IF K=82:RNUM%=1:EXIT NUMBER
28 IF K=83:RNUM%=2:EXIT NUMBER
29 IF K=75:RNUM%=3:EXIT NUMBER
30 END REPeat NUMBER
31 END DEFine
32 :
33 REMark WORK IS THE MAIN CONTROL PROCEDURE
34 :
35 DEFine PROCedure WORK
36 CLS#3:PRINT#3," COMPRESSING...":NUM%=1
37 OPEN_IN#5,F1$:DELETE F2$:OPEN_NEW#6,F2$
38 INPUT#5,A$:PRINT A$:SHORTEN A$
39 IF SEV%=1
40 REPeat FULL
41 IF EOF(#5):RETurn
42 INPUT#5,A$:PRINT A$:IF CONCAT(A$)=0:SHORTEN A$:
GO TO 41
43 IF EOF(#5):SHORTEN A$:RETurn
44 INPUT#5,B$:PRINT B$:IF CONCAT(B$)=0:SHORTEN A$:
SHORTEN B$:GO TO 41
45 IF CONCAT(A$)=1 AND CONCAT(B$)=1
46 A$=A$&","&B$("DATA " INSTR B$+5 TO)
47 ELSE
48 A$=A$&":"&B$(" " INSTR B$+1 TO)
49 END IF
50 SHORTEN A$
51 END REPeat FULL
52 END IF
53 IF SEV%=2
54 REPeat SHORT
55 IF EOF(#5):RETurn
56 INPUT#5,A$:PRINT A$:SHORTEN A$
57 END REPeat SHORT
58 END IF
59 END DEFine
60 :
61 REMark COMPLETE IS CALLED AT THE END OF THE COM
PRESS. IT ASKS THE
62 REMark USER QUESTIONS OF WHAT IS REQUIRED NEXT.
63 :
64 DEFine PROCedure COMPLETE
65 CLOSE#5:CLOSE#6
66 CLS#3:PRINT#3," COPY NEW FILE FROM  DRIVE 2 TO
1 (Y/N)":GETKEY
67 IF K=89:DELETE F1$:COPY F2$ TO F1$
68 CLS#3:PRINT#3," USE COMPRESS AGAIN (Y/N)":GETKE
Y:IF K<>78:CLS:CLS#4:GO TO 9
69 WINDOW 512,256,0,0:PAPER 0:CLS:OPEN#2,SCR:PAPER
#2,0:CLS#2:OPEN#1,SCR:INK#2,7:INK 7:INK#0,7:NEW
70 END DEFine
71 :
72 DEFine PROCedure GETKEY
73 K=CODE(INKEY$(-1))
74 END DEFine
75 :
76 REMark SETUP WILL SET THE SCREEN DESIGN
77 :
78 DEFine PROCedure SETUP
79 MODE 4:WINDOW 512,256,0,0:PAPER 4,7,2:CLS:BLOCK
 439,236,41,16,0
80 WINDOW 439,236,36,11:PAPER 0,7:CLS
81 WINDOW 172,30,295,16:PAPER 2:CLS:BORDER 1,0:INK
 7
82 CSIZE 3,1:PRINT " COMPRESS"
83 WINDOW 210,190,42,51:BORDER 1,0:PAPER 7:CLS:INK
 0:CSIZE 0,0
84 OPEN#4,SCR_210x190a257x51:BORDER#4,1,0:PAPER#4,
7:CLS#4:INK#4,0
85 OPEN#3,CON_247x30a42x16:PAPER#3,4:BORDER#3,1,0:
CLS#3:INK#3,0
86 END DEFine
87 :
88 REMark SHORTEN IS ONE OF THE MAIN PROCEDURES IN
 THE PROGRAM. IT WILL
89 REMark REDUCE THE SIZE OF COMMANDS TO THEIR SHO
RTER FORM, IE-
90 REMark 'DEFine PROCedure TIME' BECOMES 'DEFPROC
 TIME'
91 :
92 DEFine PROCedure SHORTEN(T$)
93 I$=T$:I%="REMark " INSTR T$
94 IF I%:T$=T$(1 TO I%-1):IF LEN(T$)<8:T$=""
95 I%=" :" INSTR T$
96 IF I% AND LEN(T$)<8:T$=""
97 I%="DEFine PROCedure " INSTR T$
98 IF I%:T$=T$(1 TO I%-1)&"DEFPROC"&T$(I%+16 TO)
99 I%="DEFine FuNction " INSTR T$
100 IF I%:T$=T$(1 TO I%-1)&"DEFFUN"&T$(I%+15 TO)
101 I%="REPeat " INSTR T$
102 IF I%:T$=T$(1 TO I%-1)&"REP"&T$(I%+6 TO)
103 I%="END REPeat " INSTR T$
104 IF I%:T$=T$(1 TO I%-1)&"ENDREP"&T$(I%+10 TO)
105 I%="SELect ON " INSTR T$
106 IF I%:T$=T$(1 TO I%-1)&"SEL ON"&T$(I%+9 TO)
107 I%="END SELect " INSTR T$
108 IF I%:T$=T$(1 TO I%-1)&"ENDSEL"&T$(I%+10 TO)
109 I%="RETurn" INSTR T$
110 IF I%:T$=T$(1 TO I%-1)&"RET"&T$(I%+6 TO)
111 I%="LOCal " INSTR T$
112 IF I%:T$=T$(1 TO I%-1)&"LOC"&T$(I%+5 TO)
113 I%="LET " INSTR T$
114 IF I%:T$=T$(1 TO I%-1)&T$(I%+4 TO)
115 I%="END DEFine " INSTR T$
116 IF I%:T$=T$(1 TO I%-1)&"ENDDEF"
117 I%="THEN " INSTR T$
118 IF I%
119 TT$=T$(1 TO I%-2)
120 IF LEN(T$)=LEN(TT$)+6:T$=TT$:ELSE T$=TT$&":"&T
$(I%+5 TO)
121 END IF
122 I%="END IF " INSTR T$
123 IF I%:T$=T$(1 TO I%-1)&"ENDIF"&T$(I%+6 TO)
124 I%="END FOR " INSTR T$
125 IF I%:T$=T$(1 TO I%-1)&"ENDFOR"&T$(I%+7 TO)
126 IF T$<>I$:GO TO 93
127 IF T$="":RETurn
128 I%=" " INSTR T$
129 IF RNUM%=1:NUM$=NUM%:T$=NUM$&T$(I%+1 TO):NUM%=
NUM%+1
130 IF RNUM%=2:T$=T$(1 TO I%-1)&T$(I%+1 TO)
131 IF RNUM%=3:T$=T$(I%+1 TO)
132 PRINT#4,T$:PRINT#6,T$
133 END DEFine
134 :
133 END DEFine
134 :
135 REMark CONCAT WILL TEST SUPERBASIC LINES WHETH
ER OR NOT THEY CAN
136 REMark BE CONCATENATED (JOINED TOGETHER).
```

```
137 :
138 DEFine FuNction CONCAT(T$)
139 IF "DEFine FuNction " INSTR T$:RETurn 0
140 IF "DEFine PROCedure " INSTR T$:RETurn 0
141 IF "END DEFine" INSTR T$:RETurn 0
142 IF "FOR " INSTR T$:RETurn 0
143 IF "IF " INSTR T$:RETurn 0
144 IF "SELect ON " INSTR T$:RETurn 0
145 IF "END SELect" INSTR T$:RETurn 0
146 IF "REPeat " INSTR T$:RETurn 0
147 IF ":" INSTR T$ AND LEN(T$)<8:RETurn 0
148 IF "DATA " INSTR T$:RETurn 1
```

149 RETurn -1

150 END DEFine

QL Conversion/Calculator by E. Bamber

This program provides a weights and measures convertor and a reverse Polish calculator. Of the 63 units selectable for conversation, conversions may be made from imperial to imperial, imperial to metric, and vice versa.

The program is completely menu-driven and very fast because of the structure of the data: it is designed for string slicing of the output from a two-dimensional string array organised to coincide with the cursor x, y coordinates.

There is provision for the output of the conversion tables to both the screen and Epson-compatible printers.

```
1 REMark *** prog ABACON 1 (ver 1.0) author E.J.B
amber. june 1986 ***
2 DIM XY$(49,10,22):DIM RES(34)
3 CNUM=7:HNUM=4:TAB$="":TAB2$="":II$="":I2$="":ANS
$="": SCRNS
4                          DEFine PROCedure SCRNS
5 MODE 4:PAPER 0:INK 7:CSIZE 1,0:BORDER 2,CNUM:CSI
ZE#0,1,0:BORDER#0,1,CNUM
6 BLOCK 145,42,155,125,CNUM:SP$ ='
:STRIP HNUM:INK 0:AT 14,40:PRINT' Convertor ':STRI
P 0:INK 7
7 PAPER#0,HNUM:INK#0,0:CLS#0:AT#0,0,14:PRINT#0,'F1
  F2  F3  F4  F5  ALT> ALT?':AT#0,1,0:PRINT#0,'(1)
position cursor. (2)enter value. (3)position curso
r.':AT#0,2,7:PRINT#0,'(<=>?)
        (<=>?)'
```

8 PAGE1

```
9                          END DEFine
10                        DEFine PROCedure PAGE1
```

11 RESTORE 152

```
12 AT 1,1:PRINT'F1    miles  yds   feet   ins   kl
ms"  mtrs"  cms" '
13 AT 5,0:PRINT'       NuMls faths  furl  chain
mms"  micr"  Angs"'
14 AT 9,0:PRINT'       mls2  acres  yds2   ft2   k
lm2"  hect"  mts2"'
15 INIT=0:PAGE=1:AT 3,18:PRINT'?>':AT 3,38:PRINT'?
>':AT 18,15:PRINT' Length    Length    Area
```

16 XYDATA

```
17                         END DEFine
18                       DEFine PROCedure PAGE2
```

19 RESTORE 156

```
20 AT 1,1:PRINT'F2    M.gal  gals   qts   pts   M.
lts" lts"  AmGal '
21 AT 5,0:PRINT'       yds3   ft3   ins3   gals  m
ts3"  cms3" floz '
22 AT 9,0:PRINT'       tons  stone   lbs   ozs   t
ons"  kgs"  grms" '
23 INIT=0:PAGE=2:AT 3,18:PRINT'?>':AT 3,38:PRINT'?
>':AT 18,15:PRINT' Volume    Volume    Weight    '
```

24 XYDATA

```
25                         END DEFine
26                       DEFine PROCedure PAGE3
```

27 RESTORE 160

```
28 AT 1,1:PRINT"F3    year   day   hour   mins  se
cs   msec  Osec  "
29 AT 5,0:PRINT'       mph   ft/hr  ft/sc in/sc  k
m/hr"km/sc"  mt/sc"'
30 AT 9,0:PRINT'       t/ft2 t/in2 lb/ft2 lb/in2 a
tmos kg/m2" g/cm2"'
31 INIT=0:PAGE=3:AT 3,18:PRINT'  ':AT 3,38:PRINT'
 ':AT 18,15:PRINT' Time      Speed     Pressure'
```

32 XYDATA

```
33                         END DEFine
34                       DEFine PROCedure ARITH
35 AT 18,13:PRINT FILL$(' ',31):AT 1,1:PRINT'   ':
CLS#0:AT 1,1:PRINT 'F5':AT 18,19:STRIP HNUM:INK 0:
PRINT' Reverse Polish. ':STRIP 0:AT#0,1,5:PRINT#
0,'ARITHMETIC                          TRIGONOM
    Enter numerator          ESC          Numerato
r only    then denominator.                  for
 Trig. ':AT 14,3::STRIP HNUM:PRINT'    Memory   ':
AT 14,40:PRINT'  Calculator ':STRIP 0:AJ$='0':AK$=
'0':tx=0
36 BLOCK 145,42,155,125,CNUM
37 INK 7:AT 13,21:PRINT SP$:AT 13,34:PRINT"'":AT 1
5,21:PRINT SP$
38 IF ANS$>'0' THEN CSIZE 0,0:AT 16,7:PRINT (II$&I
2$);TAB$:AT 17,7:PRINT ANS$;TAB2$:CSIZE 1,0
39 AT 13,22:INPUT AI$:IF CODE(AI$)< '45' OR CODE(A
I$)> '57' THEN GO TO 37
40 IF AJ$>'0' THEN GO TO 44
41  AT 15,22:INPUT AJ$:IF LEN(AI$)>12 OR LEN(AJ$)>
12 THEN CLS:AT 7,12:PRINT 'Input restricted to 12
digets max.'\\,'    When using scientific notation
....'\\,,'use max of(1E300 X 1E300)':PAUSE 500:SCR
NS:ARITH
42 IF AJ$="" THEN AT 15,21::PRINT SP$:GO TO 46
43 IF CODE(AJ$)<'45' OR CODE(AJ$)>'57' THEN GO TO
41
44  RES(34)=AI$-AJ$:RES(31)=AI$+AJ$:RES(28)=AI$*AJ
$:RES(25)=AI$/AJ$:RES(22)=AI$*AJ$/100
45 X=28:K$=' ':STRIP 4:INK 0:AT 16,21:PRINT' %  /
 X  +  - ':GO TO 48
46 IF AI$>1E-4 AND AI$<1E7 THEN AI$=ABS(AI$): RES(
34)=AI$^.5:RES(31)=AI$^2:RES(28)=SIN(RAD(AI$)):RES
(25)=COS(RAD(AI$)):RES(22)=TAN(RAD(AI$)):ELSE :CLS
#0:PRINT#0,\'  ERROR:  INPUT RANGE FOR TRIG FUNCS
.001..TO..1000000':PAUSE 200:ARITH
47 X=28:K$=' ':STRIP 4:INK 0:AT 17,27:PRINT'___':A
T 16,21:PRINT' TA CS SN SQ RT'
48 AT 0,14:PRINT'          space bar
```

49 REPeat CALC

```
50 STRIP 4:INK 7:AT 18,19:PRINT' <                >
?':INK 0
51 STRIP 0:AT 17,X-1:INK 7:PRINT'   ':AT 1,1:PRINT
 'F5'
52 IF CODE(K$)='200'THEN X=X+3:IF X>34 THEN X=22
53 STRIP 4:INK 7:AT 17,X-1:PRINT' = ':INK 0:AT 18,
21:PRINT' '&RES(X)
54 IF CODE(K$)='192' THEN AK$=RES(X):AT 14,3:PRINT
 SP$:STRIP 4:AT 14,17-LEN(AK$):PRINT AK$
55 IF CODE(K$)='209' AND AJ$="" THEN STRIP 0:INK 7
:AT 13,21:PRINT SP$:AT 13,22:PRINT AK$:AI$=AK$:AT
17,X-1:PRINT'   ':GO TO 46
56 IF CODE(K$)='209'THEN STRIP 0:INK 7:AT 13,21:PR
INT SP$:AT 13,22:PRINT AK$:AI$=AK$:AT 17,X-1:PRINT
'   ':GO TO 44
57 IF CODE(K$)='217'THEN STRIP 0:INK 7:AT 15,21:PR
INT SP$:AT 15,22:PRINT AK$:AJ$=AK$:AT 17,X-1:PRINT
'   ':GO TO 44
58 IF CODE(K$)='208' THEN AI$=RES(X):STRIP 0:INK 7
:AT 13,21:PRINT SP$:AT 15,21:PRINT SP$:AT 15,22:PR
INT AJ$:AT 13,22:PRINT AI$:AT 17,X-1:PRINT'   ':IF
 AJ$="" THEN GO TO 46: ELSE :GO TO 44
59 IF CODE(K$)='216' THEN AJ$=RES(X):STRIP 0:INK 7
:AT 15,21:PRINT SP$:AT 15,22:PRINT AJ$:AT 17,X-1:P
RINT'   ':GO TO 44
60 K$=INKEY$(-1):IF CODE (K$) = '27' THEN EXIT CAL
C
61 IF CODE(K$)='10' THEN AT 15,21:STRIP 0:INK 7:PR
INT SP$:AT 17,X-1:PRINT'   ':GO TO 41
62 IF CODE(K$)>'44' AND CODE(K$)< '58' THEN STRIP
0:AT 17,X-1:PRINT'   ':AT 13,21:PRINT SP$:INK 7:GO
 TO 39
63 IF CODE(K$)='32'THEN AT 12,1:SCROLL-110,1:AT 0,
14:PRINT'          space bar          ':BLOCK 110,30
,25,155,0:tx=tx+1:IF tx MOD 2=1 THEN CSIZE 0,0:INK
 0:BLOCK 320,95,60,10,4:AT 2,12:PRINT'Number to nu
merator....enter number.':AT 3,19:PRINT'to denomin
ator..press ENTER then number.':AT 4,19:PRINT 'Rig
ht Arrow.....answers.....':AT 5,19:PRINT'Lef
t Arrow.....answer to memory.':AT 6,19:PRINT'Up A
rrow.....answer to numerator.':AT 7,19:PRINT'Do
wn Arrow.....answer to denominator.':AT 8,19:PRIN
T'ALT Up Arrow....memory to numerator.':AT 9,19:PR
INT'ALT Down Arrow..memory to denominator.':CSIZE
1,0
```

```
64                  END REPeat CALC
65                  SCRNS
66                                  END DEFine
67                          DEFine PROCedure EXPAND
68 IF II$="" OR II$=ANS$ THEN CLS:AT 1,1:PRINT'F4'
:AT 6,15:PRINT'To Expand on a Conversion:':AT 9,14
:PRINT'Select Units from F1 F2 or F3':AT 10,15:PRI
NT "then return to this screen.":CLS#0:AT#0,1,25:P
RINT#0,' ESC ':PAUSE:SCRNS
69 AT 1,1:PRINT'    ':IF pr MOD 2=1 THEN nm$='Conve
rsion ':U$=(II$&I2$):OXY$=CONV$/U$:T$='0':TB$=TAB$
:TB2$=TAB2$
70 IF pr MOD 2=0 THEN AT 13,21:PRINT SP$:AT 15,21:
PRINT SP$:nm$='Temperature':T$='32':TB$=CHR$(186)&
'F':TB2$=CHR$(186)&'C'
71 BF$='10':WF$='1':CLS#0:AT 12,15:PRINT 'F4':AT#0
,1,25:PRINT#0,' ESC':AT#0,2,18:PRINT#0,'(:F to :C
)  press F4':AT 13,34:PRINT TB$:AT 15,34:PRINT TB2
$:AT 18,14:PRINT'<= (x10) ';nm$;' (x     ) >?'
72 AT 17,35:PRINT'Increment.':AT 18,37:INPUT WF$

73                  REPeat CONVRT
74 IF pr MOD 2=1 THEN AT 13,22:PRINT U$+T$:AT 15,2
1:PRINT(OXY$*(U$+T$))/XY$(X,Y)(1 TO 10)
75 IF pr MOD 2=0 THEN :AT 13,23:PRINT T$:CENT$=(T$
-32)*5/9:AT 15,23:PRINT CENT$(1 TO 6)
76 IF CODE(INKEY$(-1))='27'THEN EXIT CONVRT
77 IF KEYROW(1)=16  THEN T$=T$+BF$
78 IF KEYROW(1)= 2  THEN T$=T$-BF$
79 IF KEYROW(1)= 4  THEN T$=T$+WF$
80 IF KEYROW(1)=128 THEN T$=T$-WF$
81 IF KEYROW(0)=1 THEN pr=pr+1:EXPAND
82 AT 13,21:PRINT '             ':AT 15,21:PRINT

83          END REPeat CONVRT
84        SCRNS
85                                  END DEFine
86                          DEFine PROCedure TABLES
87 ORU$=XY$(X,Y)(11 TO 12):IF II$="" OR TAB$<>TAB2
$ THEN CLS:ELSE :CLS:GO TO 90
88 AT 1,1:PRINT'ALT>':AT 5,14:PRINT"To Produce Equ
ivalent Tables:"
89 AT 1,1:PRINT'ALT>':AT 9,2:PRINT 'Enter start va
lue for tables at any selected units
           in F1 F2 or F3,
         then return to this screen.':CLS#0:AT#0,1
,25:PRINT#0,' ESC ':PAUSE:SCRNS
90 CLS#0:AT#0,1,19:PRINT#0,'Press ENTER to quit':A
T 1,19:PRINT"Equivalent  Tables.":AT 2,17:PRINT'(E
NTER Increment      )':AT 2,34:INPUT vlu$:PRINT:PR
INT,'      Output to Screen or Printer ?' \\\
91 IF vlu$="" THEN SCRNS
92 IF INKEY$(-1)=='P'THEN :OPEN#13,SER1:BAUD 9600:
PRINT#13,CHR$(27);'@';:GO TO 94
93 BORDER 0:CLS:OPEN#13,con:INK#13,7
94 CLS#0:AT#0,1,26:PRINT#0,'ESC':AT#0,2,18:PRINT#0
,'To pause use CTRL F5'
95 u=X:U$=(II$&I2$):OXY$=CONV$/U$
96  FOR NU=0 TO vlu$*99 STEP vlu$
97    PRINT#13,,,XY$(49,Y)(14 TO 22)
98    PRINT#13,,,U$+NU!!ORU$
99    FOR X=7 TO 49 STEP 7
100     PRINT#13,,,,,"   ="!!(OXY$*(U$+NU))/(XY$(X,
Y)(1 TO 10))!!XY$(X,Y)(11 TO 12)
101    END FOR X
102   IF CODE(INKEY$)='27':PRINT#13,CHR$(27);'@';:
CLOSE#13:CLS:GO TO 90
103  END FOR NU
104 IF CODE (INKEY$(-1))='27' THEN CLEAR:RUN
105                                 END DEFine
106                         DEFine PROCedure CUSTOM
107 CLS:CLS#0:AT 1,1:PRINT 'ALT?':AT 6,17:PRINT'Co
lour select by number:':AT#0,1,18:PRINT#0,'Default
 Colours..S/BAR':AT#0,2,21:PRINT#0,'alternative..?

108 FOR C=1 TO 8:BLOCK 37,6,C*44,100,C*11.4:AT 11,
2+C*5.5:PRINT C
109 BLOCK 196,37,129,138,2:BLOCK 188,33,133,140,0:
AT 14,17:PRINT'Cursor colour         ?':AT 16,17:P
RINT'Highlight colour      ?'
110         REPeat CHK_C
111 CNUM$=INKEY$(-1):IF CODE(CNUM$)='32'THEN CNUM=
7:HNUM=4:SCRNS
112 IF CODE(CNUM$)='216'THEN CNUM=97:HNUM=2:SCRNS
113 IF CODE(CNUM$)>'47' AND CODE(CNUM$)<'58' THEN
BLOCK 37,6,270,144,CNUM$*11.4:ELSE :GO TO 111
114 HNUM$=INKEY$(-1):IF CODE(HNUM$)>'47'AND CODE(H
NUM$)<'58'THEN BLOCK 37,6,270,164,HNUM$*11.4:EXIT
CHK_C:ELSE :GO TO 114
115         END REPeat CHK_C
116 IF CNUM$=2 THEN CNUM$=.61
117 IF HNUM$=2 THEN HNUM$=.61
118 AT 18,28:PRINT'if ok ENTER':IF INKEY$(-1)=CHR$
(10) THEN CNUM=CNUM$*11.4:HNUM=HNUM$*11.4:SCRNS:EL
SE :CLS:CUSTOM
119                                 END DEFine
120                         DEFine PROCedure XYDATA
121  FOR Y=2 TO 10 STEP 4
122   FOR X=7 TO 49 STEP 7
123     READ a$:XY$(X,Y)=a$
124     BLOCK 37,4,X*7.5,Y*10,HNUM
125   END FOR X
126  END FOR Y
127 II$="":ANS$="0":X=7:Y=2:BLOCK 37,4,X*7.5,Y*10,
CNUM
128 AT 13,21:PRINT SP$:AT 15,21:PRINT SP$:AT 13,34
:PRINT'   ':AT 15,34:PRINT'   ':pr=3
129         REPeat IT
130 BLOCK 7,10,76+20*Y,180,CNUM:I$=INKEY$(-1)
131 IF CODE(I$)>'57' AND CODE(I$)<'192' OR CODE(I$
)<'46' THEN AT 15,21:PRINT SP$: GO TO 130
132 BLOCK 37,4,X*7.5,Y*10,HNUM
133 IF CODE(I$)='200' THEN X=X+7:IF X>49 THEN X=49
134 IF CODE(I$)='192' THEN X=X-7:IF X<7 THEN X=7
135 IF CODE(I$)='208'THEN Y=Y-4:BLOCK 7,10,76+20*(
Y+4),180,0:IF Y<2 THEN Y=2
136 IF CODE(I$)='216'THEN Y=Y+4:BLOCK 7,10,76+20*(
Y-4),180,0:IF Y>10 THEN Y=10
137 BLOCK 37,4,X*7.5,Y*10,CNUM
138 IF CODE(I$)='232' THEN PAGE1
139 IF CODE(I$)='236' THEN PAGE2
140 IF CODE(I$)='240' THEN PAGE3
141 IF CODE(I$)='244' THEN EXPAND
142 IF CODE(I$)='248' THEN ARITH
143 IF CODE(I$)='209' THEN TABLES
144 IF CODE(I$)='217' THEN CUSTOM
145 IF CODE(I$)>'45' AND CODE(I$)<'58' THEN INIT=1
:AT 13,21:PRINT SP$:AT 13,32:PRINT"'":AT 15,21:PRI
NT SP$:AT 13,22:PRINT I$:II$=I$:AT 13,23:INPUT I2$
:CONV$=(I$&I2$)*XY$(X,Y)(1 TO 10):TAB$=XY$(X,Y)(11
 TO 12):AT 13,34:PRINT TAB$:ROW=Y:IF LEN(I$&I2$)>1
0 OR (I$&I2$)>1E600 THEN CLS:AT 7,12:PRINT 'Input
restricted to 10 digits max'\\,'  or scientific no
tation; 1E600....max.':PAUSE 500:SCRNS
146 IF PAGE=1 OR PAGE=2 THEN IF Y<10 THEN ROW=Y
147 IF INIT=0 THEN GO TO 129
148 IF Y=ROW THEN  AT 15,21:PRINT SP$:ANS$= CONV$/
(XY$(X,Y)(1 TO 10)):AT 15,21:PRINT ANS$:TAB2$=XY$(
X,Y)(11 TO 12):AT 15,34:PRINT TAB2$:INK 7

149                 END REPeat IT
150                                 END DEFine
151 REMark              ** PAGE1 DATA **
152 DATA '63360     ML','36        YD','12
FT','1          IN','39370     KM','39.37     MT','
.3937     CM Length  '
153 DATA '72913.239 NM','72        FA','7920
FL','792        CH','.03937    MM','3.937E-5  MU','
3.937E-9  AN Length  '
154 DATA '27878400  SM','43560     AC','9
Y2','1          F2','10763870  K2','107638.7  HC','
10.76387  M2 Area  '
155 REMark              ** PAGE2 DATA **
156 DATA '8E6       MG','8         GL','2
QT','1          PT','1.759750E6ML','1.7597500 LT','
6.661448  AG Volume  '
157 DATA '1345.43300Y3','49.83085  F3','.0288373
I3','8          GL','1759.75   M3','.00175975 CC','
.0520425  FO Volume  '
158 DATA '35840     TN','224       ST','16
LB','1          OZ','35273.9   MT','35.2739   KG','
.0352739  GM Weight  '
159 REMark              ** PAGE3 DATA **
160 DATA '525600    YR','1440      DY','60
HR','1          MN','.016666666SC','1.66666E-5MS','
1.66666E-8OS Time  '
161 DATA '17.60000  MH','.003333333FH','12
FS','1          IS','10.936110 KH','39370     KS','
39.370    MS Velocity'
162 DATA '1.058489  Tf','152.42236 Ti','.000472539
Lf','.0680457  Li','1.000     At','.000096784Km','
.00096784 Gc Pressure'
163  STOP
199 REMark              ** line 200,BOOT prog (load
er screen) **
200 MODE 4:PAPER 0:CLS:BLOCK 340,75,50,55,96:CSIZE
 1,0:AT 7,19:PRINT'    ABACON  1    ':AT 9,14:PRIN
T ' QL  Convertor__Calculator ':CSIZE 0,0:AT 11,28
:PRINT' author E.Bamber.':MERGE mdv1_ABACON1:RUN
```

MICRODRIVE

THE PROGRAMS

Author	Language	Program Name	Price
1. Giles Todd	B	DIY Assembler	£5

Feaured in the March to June 1985 issues of *QL User*, this complete two-pass assembler will assemble all 68008 code and support the assembler directives DRG, END, EQU, DC and DS.

2. Richard Cross	A+O	Mini Monitor	£3

Using approximately 3K of RAM, this handy utility will multi-task on your QL, leaving plenty of room for other programs. Commands include dumping registers, memory — and ASCII — machine code trace, register store, memory move, memory store — byte, word and long — and jumps. Featured in *QL User*, October 1985.

3. A Didcock	B	Connect4	£1

A SuperBasic version of the classic four-in-a-row game where counters drop down slots in the vertical board. First printed in *QL User*, September 1985.

4. Shergold & Tose	B	Golf	£2

With up to 50 courses of varying difficulty, lakes, rivers, bunkers and trees, this is a fine golf simulation. You decide the power and direction of each stroke, striving for a birdie, eagle or even an albatross. Your scorecard may be saved. This program was printed in the May 1985 issue of *QL User*.

5. Williams & Holliday	A+O	Paladin	£5

Written completely in machine code, this excellent *Space Invaders* game was the basis of our games programming series, started in April 1985.

6. Richard Cross	M+B	Sprite Animation	£2

This contains two programs from the April 1985 issue. The first is a SuperBasic multi-coloured sprite designer. The second contains machine code routines to animate the sprites on the screen.

7. Steve Deary	B	Pacman	£1

A well-written maze game from the March 1985 issue. Almost 20 screens of increasing difficulty, including an invisible maze, make it a very versatile rendition of the arcade favourite.

8. Andy Carmichael	B	Family Tree	£3

Based on an article in the August 1985 issue, this is an Archive program and database for setting-up and displaying large family trees.

9. James Lucy	L	Composer	£3

Completed in *QL User*, October 1985 this QLiberated program will allow you to compose, play and amend your own melodies. The program will handle sharps, vary tempo, and even specify staccato and legato playing styles.

10. Matthew Capp	B	Miners	£2

This interesting simulation, printed in the August 1985 issue, puts you in the role of the NCB, buying and selling coal and mines, hiring and firing miners, and raising or decreasing wages to match economic forces. The object is to be profitable but inexperienced players will find it difficult even to remain solvent.

11. P J Smith	B	DIY Adventure	£1

From the February 1985 issue, this skeleton program requires you to slot in the details to create your own adventure programs.

12. R Green	B	Othello	£1

This classic board game, printed in *QL User*, August 1985, can be played by one or two players. The display uses a 3D representation of the board. Average response time by the computer opponent is about 15 seconds.

13. S J Ackers	S	Touch Type	£4

This program consists of a 13-lesson course for typing-in letters, words and phrases, a 700-word vocabulary, an interactive keyboard display and a fingering chart inas more than 30K of code. Scores are displayed based on the time and accuracy of typing. A reduced version of the program was printed in the August 1985 issue.

14. Rob Sherratt	A+O	Fcopy	£4

The first part of this program was printed in the March 1986 issue of *QL World*. The program is an ultra-fast, general-purpose file spooler.

15. Alan Prior	B	World Map	£2

From the March 1986 issue, this program will draw a full-screen, multi-coloured map of the world for geography buffs.

16. J M Dower	B	Mushyman	£2

Printed in the June and July 1986 issues, this provides speedy SuperBasic arcade action as you munch your way round the screen.

17. Tony Quinn	S	CAD QL	£4

CAD design programs are particularly suited to the QL. This version from the September 1986 issue includes features such as rubber-banding and a user-definable symbol library.

18. Stuart Campbell	M+B	Attack of the Things	£3

Typical science fiction horror arcade action as yet more nasties descend on harmless QL owners. Featured in the October 1986 issue of *QL World*.

19. Karl Jeffery	M+B	Starport 2001	£3

Fast machine code action in this November 1986 version of the *Galaxians* arcade game.

20. Marcus Jeffery	S	QL Go	£4

The oriental game of Go is so complex that even mainframe programs are easily beaten by novice players. To the best of our knowledge, this 15x15 version from the April and May 1986 issues is the only one available for the QL.

21. J P Hartley	B	Britain	£2

Another program for geography buffs from the November 1986 issue of *QL World*. This is a round-Britain geography quiz.

22. KBG Judson	B	Darts	£2

Program of the Month from December 1986. This popular pub pastime requires good hand and eye co-ordination to stop a moving cursor on the on-screen board.

EXCHANGE

KEY					
	B	= SuperBasic	A+B+O	=	Assembler and Basic Loader and Object Code
	A+O	= Assembler and Object Code	S	=	Supercharged
	M+B	= Machine Code and Basic Loader	L	=	QLiberate

23. Neil Taylor S **Window Designer** £2

This useful routine from the February, 1987 issue allows you to design your SuperBasic windows using the cursor keys. It creates a one-line procedure which, when merged into your program, will re-create that window.

---

24. J F Tydeman S **Design 3D** £4

Published in the March and April 1987 issues, this program will allow you to produce 3D screen designs with the minimum of fuss and aggravation.

---

25. D Carmona B **Stellaris** £4

Program of the Month from June 1987. This is an extensive real-time space adventure game against the computer, including economic simulations, lunar landing and superb graphics.

---

26. Robert Noble A+B+O **Video Effects Box1** £3

These machine code SuperBasic extensions allow you to manipulate your screens, save and recall them from memory and clear them in interesting ways. Program of the Month for July 1987.

---

27. H R Pendry B **Pontoon** £3

A graphic version of the classic card game. You play against the computer. Features include changing banker on royal pontoons, accurate betting, five card tricks and so on. Printed in the July 1987 issue of *QL World*.

---

28. Kenneth Cameron B **Picture Puzzle** £2

This short but interesting program from the July 1987 issue sets up an 8 x 8 sliding block puzzle with on-screen graphics. You can select sliding numbers or load your own picture to solve.

---

29. Peter Etheridge B **Bridge** £4

An excellent version of this popular card game. Features include accurate computer bidding, automatic or manual play, replay hands, correct scoring, save and load positions and much more. Essential for card enthusiasts.

---

30. Charles Gerrard B **Psycho** £4

Based on an article in the July 1987 issue, this is an excellent version of the famous *Eliza* program. The cartridge contains a script design program, a pre-prepared script containing more than 50 keywords and an application program. Though written in SuperBasic, complex list processing makes this version extremely fast.

---

31. B Otridge **Crossword** £5

Sold originally as a commercial program, this is the perfect aid for crossword fanatics. The program provides access by word length to a dictionary of about 12,500 words, to help solve those elusive crossword clues. Note: This program requires two Microdrive cartridges.

---

32. Phillip Sproston B **Advent2** £4

SuperBasic arcade adventure with a humorous slant. A variety of rooms, robots and problems will keep you on your toes. Full instructions included.

---

33. Leslie Fahidy B **Clock** £3

This is a complete version of the clock program, described in the June and July 1987 issues of our QL Education series. An on-screen clock can be used to set or read the time.

---

34. E. Bamber **QL Conversion/Calculator** £2

Comprising weights and measures units conventions and reverse Polish calculation, this excellent utility will convert almost anything to anything. Completely menu-driven, it is very easy to use.

---

35. John Wakefield B **Qwhist** £3

Our August 1987 Program of the Month. It is an excellent implementation of the classic card game, Whist. Designed for one player (south) who partners a computer hand (north) against the computerised east and west opponents.

---

36. Stanley Sykes B **Mail Merge** £1

This cartridge contains very handy utilities providing a mail merge and labeller for Quill files. The cartridge includes a simple demonstration.

---

37. P.G. Ives B **The Double** £4

A large strategy game in which you manage a football team through the four league divisions. The program features buying and selling, team line-up, morale, and so on, through the full league and F.A. Cup season. The cartridge includes full instructions Quill document showing how to play the game.

---

38. Leslie Fahidy B **Education** £2

As part of our series of educational programs, this is designed to help teach the solution of simple linear equations. It is aimed specifically at the 11-plus age range.

---

39. J F Tydeman S **Design 3D** £4

Featured in the March, 1987 issue, this extensive program includes a large suite of graphics and filing utilities for the production of 2D and 3D graphics. It is supplied complete with instructions in the form of a Quill document.

---

40. Santiago Rubio B **Roulette** £3

Our September, 1987 Program of the Month, this is an excellent Spanish/English version of the traditional gambling game. It also includes the Leigh Pattern, a system to break the bank.

---

41. Leslie Fahidy B **Money** £2

Continuing with our series of educational programs, this one sends you on a shopping expedition, calculating prices from shopping lists and trying to determine what coins you will receive as change.

---

42. Neil Davidson A+B+O **Life** £2

A machine code version of the classic simulation of a colony of living cells which survive, reproduce or die according to mathematical rules. Quill instructions included.

See over page for order form.

MICRODRIVE EXCHANGE

C O N T I N U E D

43. Alan Glassbrook, Ian Swinton — S — Qsquidge — £2

An arcade hunt through an 8×8 grid expandable series of rooms for the necessary nine parts of Squidge's rocket. October, 1987 Program of the Month.

---

44. David Marsh — B — Compress — £2

Compress is a utility to compress SuperBasic program files into a more compact form without losing the structure of the program. That uses less storage space and means slightly faster loading.

---

45. Ronnie Davidson — M+B — SuperBreak-out — £2

A fast machine code version of the classic wall game where, using a bat and ball, you must try to break through the wall of bricks. Special features include optional double bats and/or balls.

---

46. Norman Marks — B — Navigator — £2

To calculate the distance and direction for travel between longitude and latitude positions on the Earth. The program includes an expandable list of cities on points can be input manually. The calculation formulae can be seen from within the program.

---

47. Richard Clements — B — 3D Maze — £2

Chase round the generated maze, shown in three dimensions, searching for the key to the next level before going through the exit. Extra points can be gained by passing over Point Squares but do not be carried away because it is all against the clock.

THE ALL-NEW MICRODRIVE EXCHANGE

Microdrive Exchange has always been a popular feature of *Sinclair QL World* and, in our constant efforts to improve the magazine, we are expanding the Exchange to bring you even more quality programs at budget prices.

To achieve those results we have altered the format of the Exchange. Rather than calculating the number of sectors required by each program and sending the appropriate number of cartridges, we have now made it a one-program, one-cartridge system. So if you would like, say, four programs, then, regardless of length, you will need four cartridges.

There are a number of advantages to the system. First, the service will be much faster, because programs can be copied in advance. Second, rather than having to ensure having the article for documentation, we will be able to supply Quill documents on the Microdrive, if needed, for future programs.

Finally, for all new programs on the Exchange, rather than just receiving the machine code version, the Supercharged version or whatever, we will be able to supply assembly listings, hex loaders and original SuperBasic versions on the same cartridge, so that you can look at and amend programs.

Naturally, this service will require the transfer of more than the usual number of Microdrives but bear in mind that the number of Microdrives you send will be returned with the software, so for short programs you can squeeze them all on to a single Microdrive. We have reduced the price of Microdrives to £2 per cartridge.

With the new system, we have started to include programs which have not necessarily been featured in the magazine, either because they were too long or because we already had too many listings. Consequently we are now looking for quality programs of any length to feature in Microdrive Exchange. If you have any programs which you feel are good enough, please send them for review. The address and details for program submission is given in The Progs.

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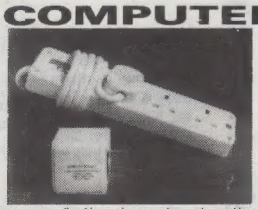

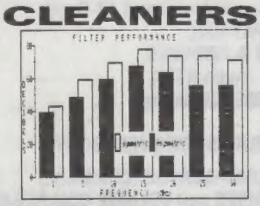

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